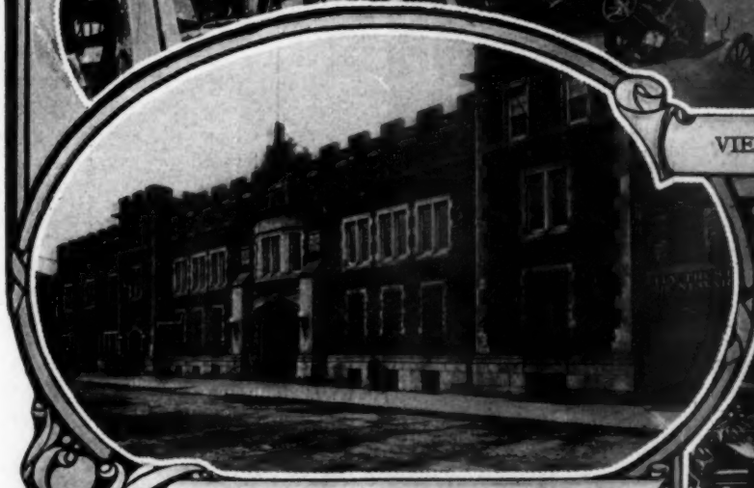
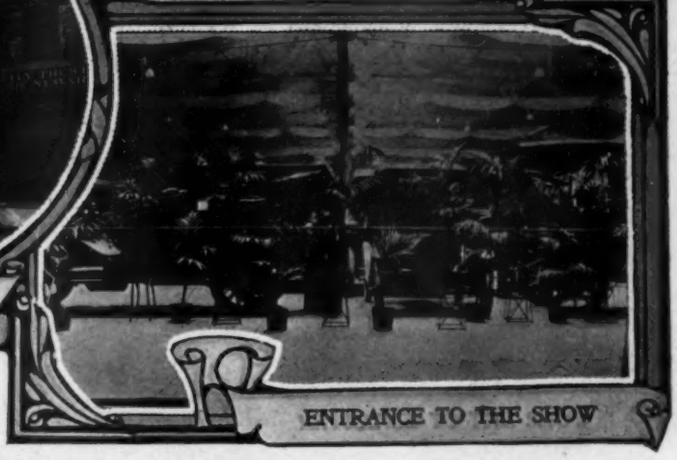
VOL. XXII NEW YORK—THURSDAY, FEBRUARY 24, 1910—CHICAGO No. 8

THE AUTOMOBILE

VIEW LOOKING TOWARDS THE REAR OF THE ARMORY



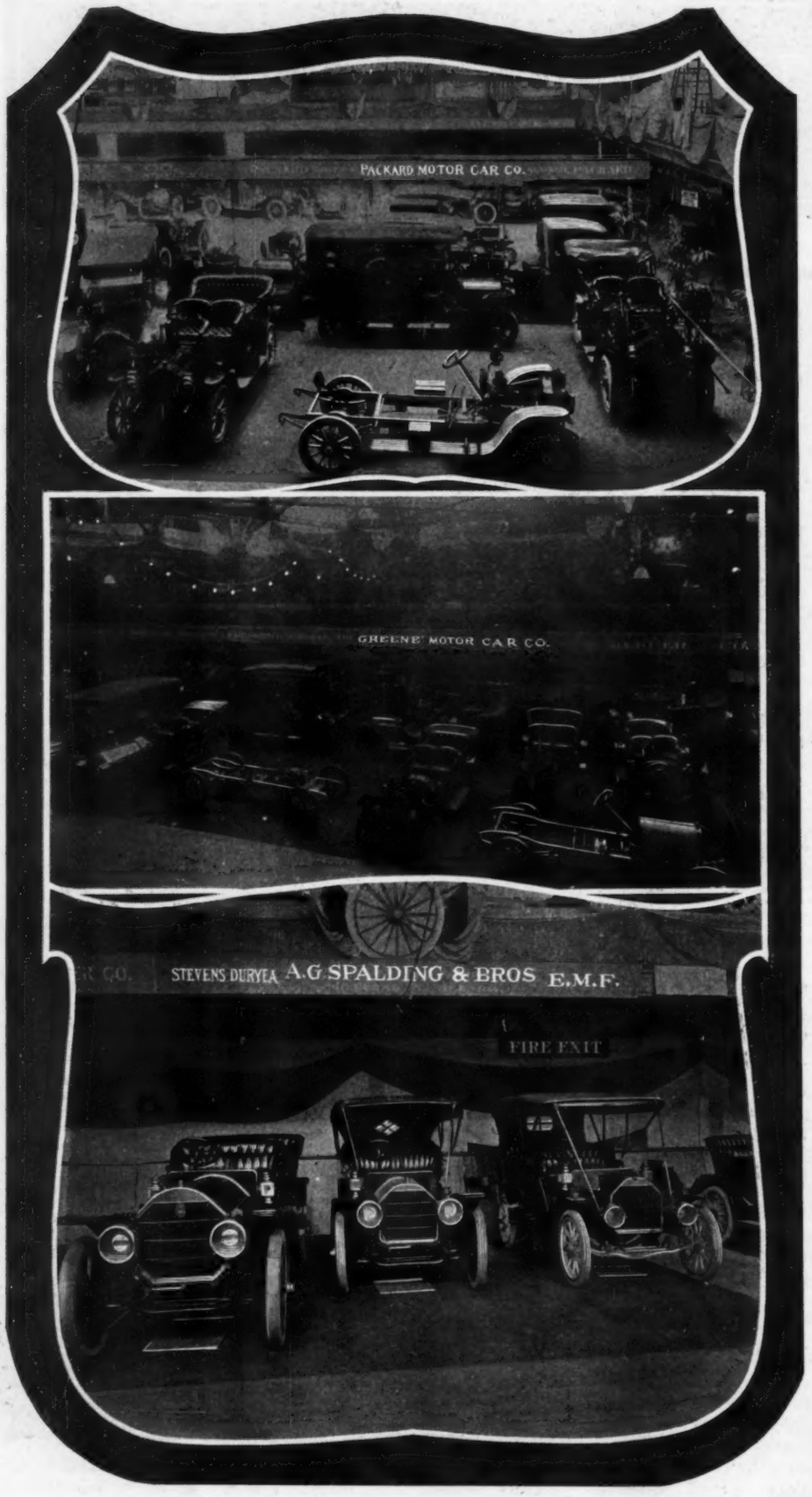
EXTERIOR OF ESSEX TROOP ARMORY, ROSEVILLE AVE., NEWARK.



ENTRANCE TO THE SHOW

NEWARK, N. J., Feb. 21—Brilliant in dress, comprehensive in detail and with a larger number of exhibits and exhibitors than in the two previous years, Newark's third annual automobile show opened Saturday night. When Colonel Austen Colgate, aide to Governor Fort, and legislative champion of the automobile, declared the exhibition officially under way, 95 cars and chassis, representing more than two-score manufacturers, were in place and 23 accessory exhibits were ready for view. In all, 55 distinct exhibitors occupy spaces on the floor or in the gallery.

As heretofore, the show is being conducted by the New Jersey Automobile Exhibition Company, affiliated with the New Jersey



Top—Packard Exhibit, in Charge of the Newark Branch Office
Middle—Peerless and Locomobile Stands to the Left; on the Right, Mercer, a Native of New Jersey
Bottom—Spalding Showed Both Stevens-Duryea and E-M-F

Automobile Trade Association and the New Jersey Automobile and Motor Club, and is held in the armory of the First Troop—better known as Essex Troop—of the State National Guard, on Roseville avenue.

Profiting by experience, the management left no stone unturned in its effort to make this year's show successful from every standpoint. They were rewarded with unusual interest on the part of the prospective exhibitors and the spaces were soon leased. Later, indeed, it was found necessary to utilize corners, which in the original plan were to have been left open.

Twenty-two of the exhibits are of automobiles exclusively; 23 are devoted to accessories and there is a motorcycle adjunct to the main exhibition. There is a separate section for commercial vehicles and also an aviation department. Fifteen types of cars are shown for the first time in Newark. Additions to the show are expected to-day and to-morrow, so that the total before the coming Saturday, the last day of the show, will reach considerably above 100.

Clothed in orange and blue bunting, with palms and other potted plants banked here and there in cases of green, the erstwhile barn-like armory presents a brilliant spectacle. Between each festoon of bunting that covers the girders and brace rods of the structure, is a string of incandescent lights, and shields, painted wheels and groupings of flags, lend added attractiveness to the decorative scheme. The tan bark of the floor has, of course, been covered with planking and over all is green carpet. On the opening night the show was crowded.

Finding the demand from auto exhibitors too large to admit of quartering them all on the main floor, the management devoted one side of the gallery to the overflow. Opposite, across the building, is stationed the band, which gives concerts daily, assisted by vocalists. The balance of the gallery is occupied by the accessory exhibits.

In the number of cars displayed, the Maxwell, Pierce-Arrow, Peerless, Locomobile, Buick, Rambler and Packard lead. The majority shown throughout the entire exhibition are stock cars, but there are, of course, exceptions. Only one foreign make is included in the list—the Isotta.

Upon H. A. Bonnell, general manager of the show, and G. H. Raddin, his assistant, fell the chief burden of working out the plans, with the advice of George Paddock, president of the Exhibition Company, and Dr. James R. English, its vice-president. Mr. Bonnell is also secretary-treasurer of the company. In their work the officers were aided by the following committees: Space, Mr. Paddock, J. W. Mason, W. H. Ellis, F. L. C. Martin and G. H.

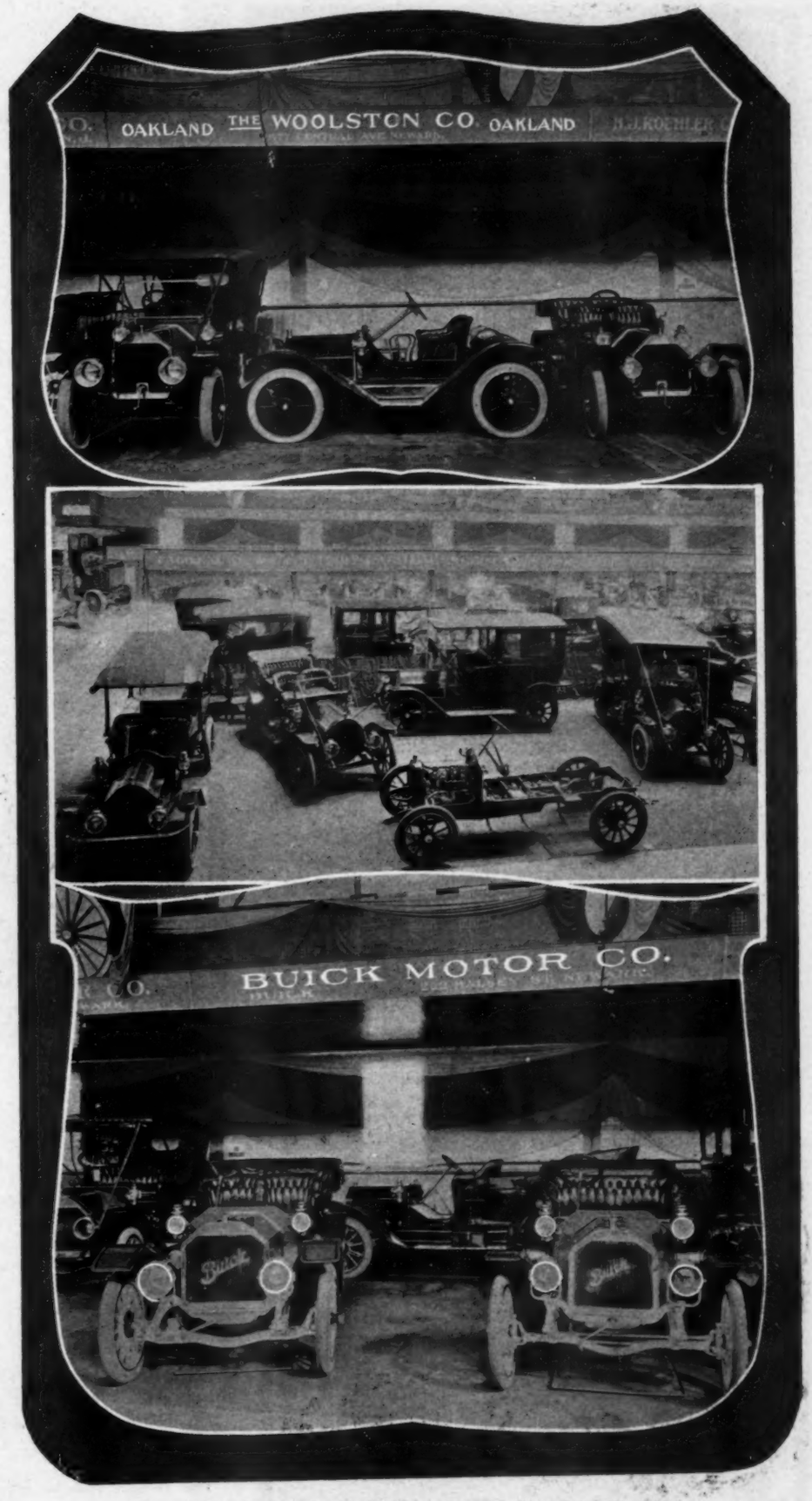
Smith; finance, R. A. Greene, I. M. Uppercu and Mr. Ellis; press, program and advertising, Mr. Bonnell, Mr. Mason, L. B. Zusi and Norris W. Brown; decorations, Messrs. Greene, Zusi and Uppercu; entertainment, J. H. Wood, F. A. Croselmire, D. C. Reynolds and Dr. English; aviation, C. E. Fisher, A. B. Le Massena, F. E. Boland and J. F. Lanier.

Not all of the exhibitors are Newarkers. There is a smattering from New York, Jersey City and towns in this section of the State.

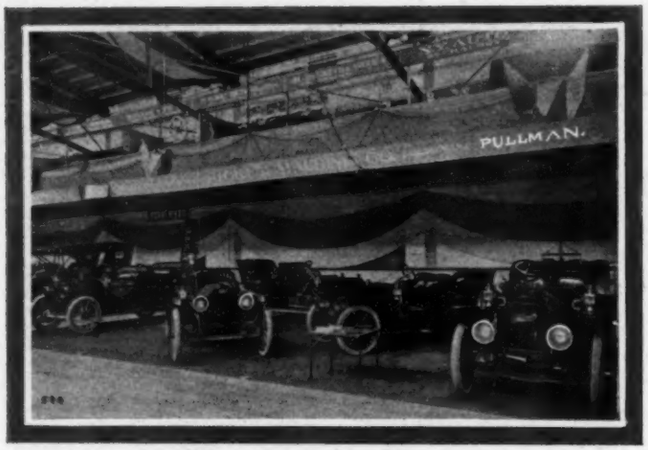
Of the manufacturers whose cars are exhibited for the first time in Newark not all are represented locally. Those of the exhibitors who are not Newarkers, however, came from near-by towns. The list of them follows:

Alexander Bruner, Newark, model 4-24 Kline Kar; the Gray Motor Car Company, Summit, N. J., Schacht delivery wagon and runabout; R. D. Norton, Hightstown, N. J., De Tamble runabout and Pickard touring car; Crescent Automobile Company, Newark, Mack (Manhattan) five-ton truck; Terry Automobile Company, Newark, Palmer-Singer 6-60, with gunboat body; H. J. Koehler & Company, Newark, Koehler 40, with torpedo body, and Rider-Lewis type X tonneauette; Woolston Company Newark, Oakland, in three models; Union Motor Car Company, East Orange, Krit runabout; A. Elliott Ranney Company, Newark, Hudson roadster and touring car, and roadster chassis; Green Motor Car Company, Newark, Mercer touring car and baby tonneau; O'Neill Motor Car Company, Newark, Paterson touring car and tourabout; J. J. Meyer, Orange, N. J., Auburn model X touring car, and G. F. Little, West Hoboken, N. J., G. J. G. touring car with gunboat body.

Other exhibitors, more familiar to the Newark show-goers, together with their lines, are as follows: Essex Automobile Company, Newark, Ford model T touring car and roadster, Jackson 40 and 50, and Brush Runabout; Detroit-Cadillac Motor Company, Newark, Cadillac demi-tonneau, limousine and touring car; Essex County Overland Company, Overland models 38, 40 and 41, and Marion touring car, roadster and chassis; F. L. C. Martin, Newark and Plainfield, Mitchell models R, S and T, and Hupmobile; Autocar Company, Ardmore, Pa., Autocar touring car; Newark Auto & Engineering Company, Newark, Rambler models 53 and 55, and 55 chassis; Rickey Machine Company, East Orange, Pullman and Marmon; A. G. Spalding & Brothers, Newark, Stevens-Duryea and E-M-F 30; Union Motor Car Company, East Orange, Reo models R and S, touring car and roadster, and Premier, models "Four-Forty" and "Six-Sixty"; Peerless Motor Car Com-



Top—Oakland's Premier Newark Appearance, Staged by Woolston
Middle—More Comprehensive View of the Hall; Cadillac, in Several Models, Occupies the Foreground
Bottom—Buick Had a Good Exhibit of Medium-Priced Cars



Marmon and Pullman Exhibited Jointly Under Agent's Auspices

pany, of New York, Peerless limousine model 27, landaulette 27, toy tonneau 27, touring car 28 and chassis of 27; Greene Motor Car Company, Newark, Locomobile, type "L" touring car, baby tonneau, limousine, landaulette, type "I" touring car, baby tonneau and roadster, and type L chassis; J. W. Mason, Newark, Columbia roadster and Maxwell models E, G, Q, Q1, Q2, Q3 and A, with limousine body after design by Mr. Mason; Paddock-Zusi Motor Car Company, Newark, Chalmers models Forty-J touring car, Forty-J pony tonneau, Thirty-K touring car, Thirty limousine and Thirty chassis; Ellis Motor Car Company, Newark, Pierce-Arrow models "48" suburban limousine, "big-six" touring car, "36" landau, "36" miniature tonneau and "48" stock chassis; J. M. Quimby & Company, Isotta voiturette and Isotta 30 chassis and Pennsylvania model B; Packard Motor Car Company, New York, Packard "Thirty" limousine and "Thirty" touring car and "Eighteen" touring car and chassis; Welden & Bauer, Newark, National touring car, limousine and "Speedway"; Sultan Motor Company, New York, limousine model; New Jersey Automobile Company, Newark, Moline touring car and model M; Buick Motor Car Company, Newark, Buick models 17 and 19 touring car, model 10 toy tonneau and model 10 runabout; Linkroum Automobile Company, Newark, Lozier model H (Briarcliff) and model H limousine and Oldsmobile close-coupled "Forty" and "Limited" touring car; Midland New York Company, models L toy tonneau and roadster.

Eleven types, including two chassis, representing six manufacturers, are shown in the commercial vehicle division of the show, which has a separate part of the building. Of these four and one chassis are the products of the Rapid Motor Vehicle Company, of which F. L. C. Martin is the local and Plainfield agent. Newark is primarily an industrial community and the exhibit of these vehicles attracted a large share of attention Saturday. The commercial list follows:

Detroit-Cadillac Motor Company, Cadillac chassis with commercial body by Schildwachter, of New York, after design of C. E. Fisher, manager of the Newark branch; F. L. C. Martin, Rapid 5-7 ton truck; 3-ton chassis, 1 1-2 ton express, 12-passenger sightseeing and ambulance models; Gray Motor Car Company, model D Schacht delivery wagon; Autocar Company, type 21 truck and stock chassis of same; Crescent Automobile Company, Mack Brothers Motor Car Company 5-ton truck; Buick Motor Car Company, one-ton truck.

The accessory exhibits which occupy the entire gallery save for the space reserved for the band at the far end of the armory and that over the main entrance, where the automobile overflow and three motorcycle spaces are quartered, is complete in almost every essential. One can purchase anything from a gilt hood ornament to a fur coat, from a swinging flower vase for a limousine to an inordinately luxurious pair of goggles. Practically all of the exhibitors are Newarkers, many of them manufacturers of the goods they display.

Three makes of motorcycles are exhibited at the show. They are the Yale machine, shown by Frank C. Cornish, of Newark;

De Tamble Runabout and Pickard, an Air-Cooled Bay Stater

Excelsior, exhibited by Carl Bush, of Newark, and the Indian models, of which the H. J. Koehler Company is the local agent.

The aviation section of the show, which opens to-night, will be in the guard room of the armory. Among the exhibits is a monoplane model designed and constructed by Arthur Holland, an East Orange youth. It is 11 x 6 feet in dimensions and its distinguishing feature is a 6-foot spiral spring, with a center shaft of about 5 to 1 gear, which supplies the motive power.

A Witteman glider will also be shown, together with an 8-cylinder monoplane from F. E. Boland, of Rahway, N. J. The former is 20 x 4 1-2 feet. A 44-foot Wright type will also be included in the exhibit, with more than a dozen models furnished by the West Side Y. M. C. A., of New York. Accessory exhibits will include a display by the Hartford Rubber Company and a propeller by the Requa-Gibson Company, of New York.

The section will be officially opened by Wilbur R. Kimball, secretary of the Aeronautic Society, of New York, who will give an illustrated lecture. C. E. Fisher planned and has charge of the exhibit.

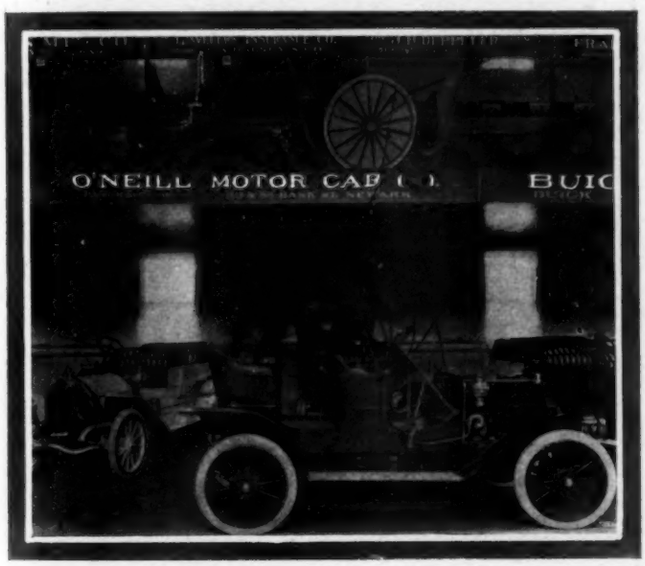
Little Hupmobile Runabout Kept Company with the Mitchells

Members of the New Jersey Automobile and Motor Club have appointed a committee to organize an aviation section to be known as the Aeronautic Society of New Jersey. It is proposed that the affiliated organization shall be a regularly incorporated body, with complete management of its own affairs, funds and property and elect its own officers and directors from its membership. The objects of the proposed society are the promotion of aviation in general and the fostering of aeronautic meets and other matters connected with the sport.

Membership will not be limited to persons belonging to the Motor Club, but the dues will be larger. The committee consists of W. Clive Crosby, president of the automobile club, chairman; C. E. Fisher, F. E. Boland, W. R. Kimball, A. B. LeMassena and J. F. Lanier.

BINGHAMTON'S AUTO SHOW NOTABLE

BINGHAMTON, N. Y., Feb. 22—Nobody looking in upon the first annual automobile show held under the auspices of the Binghamton Automobile Club and the Chamber of Commerce would ever dream that Binghamton was a town of merely 50,000 souls. That information is about the most surprising imaginable especially after a detailed examination of this splendid exhibition in the State Armory which was thrown open to the public for one week, beginning last night.



Paterson "30," Another to Make Initial Newark Appearance

To be specific there are nearly sixty completed cars shown on the floor, 59 exactly, with about eight or ten demonstrators in attendance at the front door. Then there are seven ancient monarchs illustrative of the progress of the industry since 1899, and an aeroplane in the riding hall of the basement.

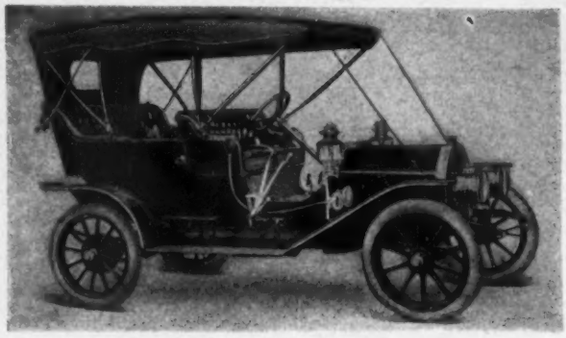
The first surprise is occasioned by the electric sign stretched across the street in front of the armory. This is a gorgeous changeable electric device that puts to shame many of the famed Broadway signs. Inside the decorations are military in design in keeping with the surroundings. The profusion of bunting and flags is well arranged without being overdone and the lighting is great. On the main drill floor, nothing but completed cars are to be found, except that the official headquarters of the club are located right at the entrance. There are 32 makes of cars, one of the newcomers of which is the Imperial, made in Jackson, Mich. This is shown by F. E. Spawn Co. for the first time at any of the local New York shows. The Binghamton Cadillac Co., unable to get a stripped sectional chassis from Detroit cut away one of their own stock cars and mounted it.

A. E. Wheeler, Syracuse district manager of the Franklin Co., has sprung the real novelty of the show in the demonstration line. He is driving about the streets, the glass hood electric-lighted Franklin six the same as furnished to each district manager, but in addition to that phase evolved about the cleverest scheme to show the air circulation that could well be imagined. Standing at the front end of the hood is a boy with a bee smudge bellows in which is burning punk, such as is used in handling honey bees. The boy works this smudge so that it flows constantly into the hood of the car, where its movement can be easily traced as the suction fan in the rear of the cooling case draws the air currents by the cylinders and expels them underneath the car. All during the show this car stands directly in front of the armory. The basement houses a varied and interesting line of accessories, motorcycles and bicycles. Here, indeed, is a novelty. Frank T. Abbott and the Waldron Drug Co. have large exhibits composed entirely of bicycles and they attracted lots of attention by their sheer novelty.

National Fours Were Featured by Weldon & Bauer Company

The Riding Academy, just to one side of the basement proper, proved a live magnet with its most interesting exhibits. First is shown a string of old cars starting with the motor from the first car ever seen in Binghamton. This was an old two-cylinder, two and a half horsepower car with gears directly attached to the connecting rods, which were concentrically attached to a shaft that held a big solid iron wheel upon which ran a rope belt. The affair without a name was owned by Joseph P. Noyes in 1898. Then, in succession, indicative of the years in which they were seen, are a steam locomobile roadster, Oldsmobile runabouts, three-wheel Knox, Pierce runabout, chain-driven Searchmont, Jones, Corbin, Packard, and a later Pierce. In the center of the Academy is the first aeroplane ever seen in Binghamton. It is a Curtiss, with an American-British four-cylinder engine.

Chassis and Several Rambler Touring Models Appeared



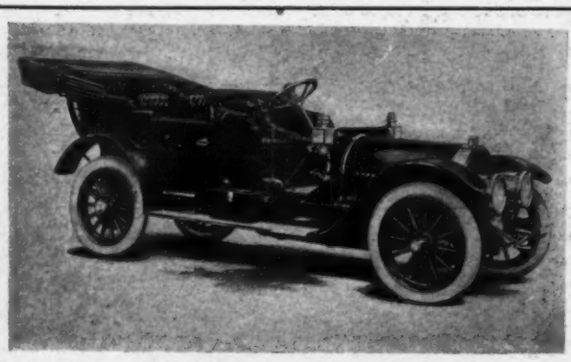
E-M-F "30" Four-Cylinder Touring

LOCAL makers of automobiles are all at the Cleveland Show with the exception of one, there being 21 different makes of automobiles exhibiting 104 separate models of cars. The Central Armory, which is dressed for the occasion, was taken in hand by the Cleveland Automobile Show Company, under the direction of Frank W. Philips, President; Harry S. Moore, Vice-President; Hobart M. Adams, Secretary, and Clarence M. Brockway, Treasurer. In addition to the exhibition of the automobiles, the accessory makers are there in force, among which will be found 26 firms of local fame, displaying their wares under the most advantageous conditions, and presenting a spirit of unusual enterprise.

The committee in charge endeavored to make this last effort the equal in all respects to the other shows of the year, and the decorations, which included rich and splendidly arranged trimmings, were merely as drapings for banks of cut flowers, which were displayed to the best advantage through the lavish use of electric lights.

For the convenience of patrons a neatly decorated Tea Garden was located on the main floor, and adequate provision is made in the form of rest rooms and refreshment quarters adjoining. The Aeronautical division, which now seems to be a regular thing in connection with the display of automobiles, comprised an aeroplane which hung in the center of the Armory, and since it is the first equipment of this character displayed at a show in Cleveland, it is attracting notice.

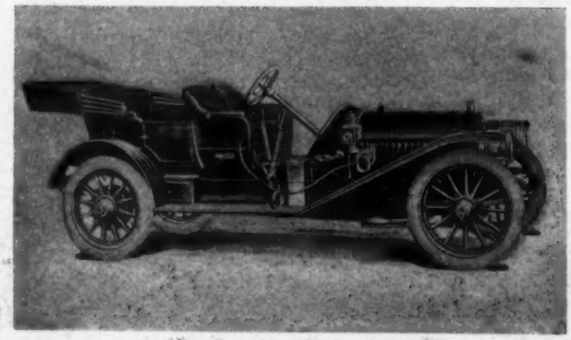
The outlook, based on the conditions which led up to the show, and considering the initial attendance, is extremely promising, and among the important phases which are distinctly noticeable is the presence of out-of-town (rural) purchasers in force. There never was a time before in the history of Cleveland automobile exhibits when the attendance was sufficiently peppered with out-of-town purchasers to be noticeable. These prospectives are well in hand with funds; they have yet to enjoy a great familiarity with the automobile situation, taking it as a whole, although it is easily discovered by salesmen that each one of them is fairly keen about some one or two makes of automobiles, and is in hand with book lore to a marked extent.



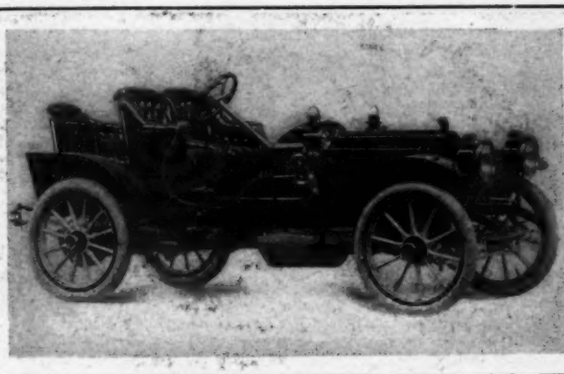
Royal Tourist Four-Cylinder Touring

MANY AUTOMOBILES

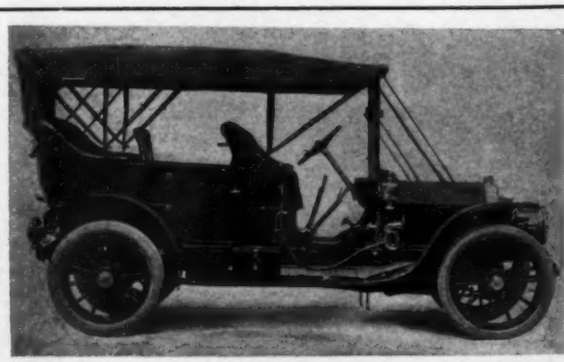
Many makers of automobiles now look upon the rural districts as representative of a considerable portion of the conditions which lead to stability, and at the Chicago Show, just closed, it was a well-recognized fact that a large percentage of the actual



Locomobile Model L Baby Tonneau



Packard "18" Four-Cylinder Runabout



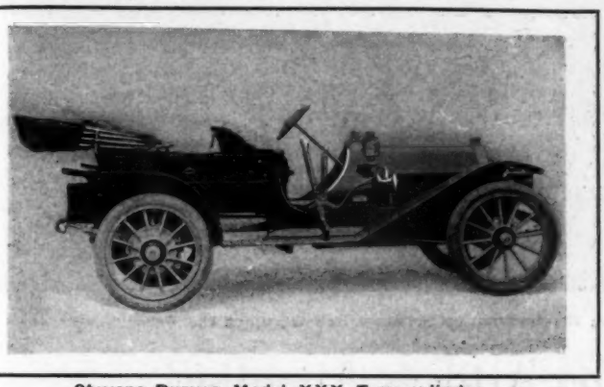
Peerless Model 27 Four-Cylinder

buyers of automobiles came from the farms and the many small towns which are scattered through rural districts. These buyers prove to be a little troublesome to the salesman who is incapable of tersely stating the facts in relation to his product. The farmer is quite unfamiliar with machinery, and he knows perfectly well that it is a considerable distance from a farm to a

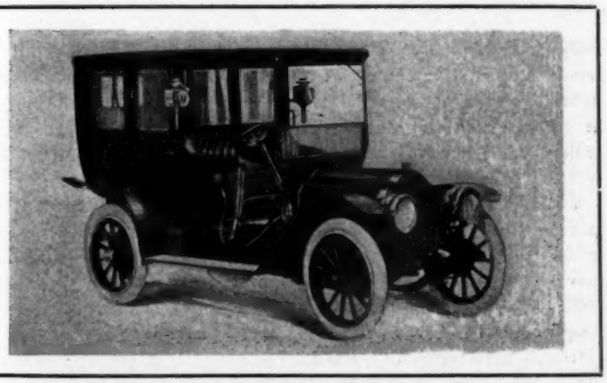
SHOWN AT CLEVELAND

repair shop, and he relies upon his own little forge for even his permanent repairs.

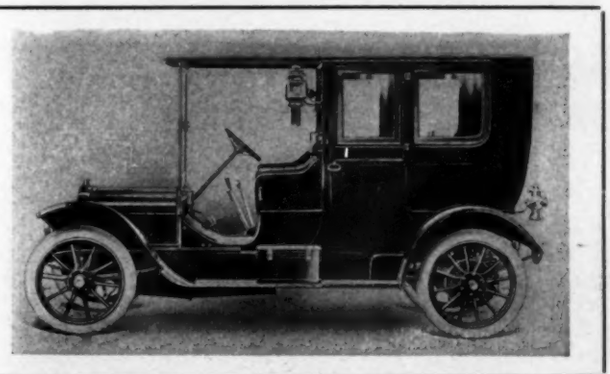
To convince this class of buyer that he can afford to indulge in a given make of automobile is to show him that it is free from that class of complications which puts it beyond the pale of repairers, considering a simple forge, a machinist's kit and the materials as bar stock, which are likely to abound the country over. Simplicity of design, ample clearance and straight line work will naturally appeal to this class of customers, and if the surplus of automobiles are to go to the farm and the small country village, it is safe to conclude that the design features must appeal to the men who must maintain the cars, rather than to have them towed to a garage repair shop.



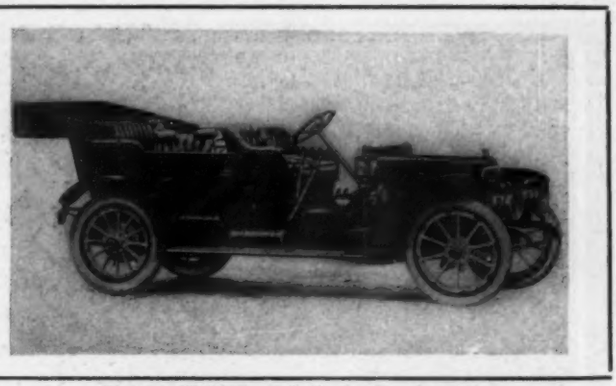
Stevens-Duryea Model XXX Four-cylinder



Studebaker-Garford Model G-7 Limousine



White Model G-B Gasoline Limousine



Stearns 30-60 Four-Cylinder Touring Car

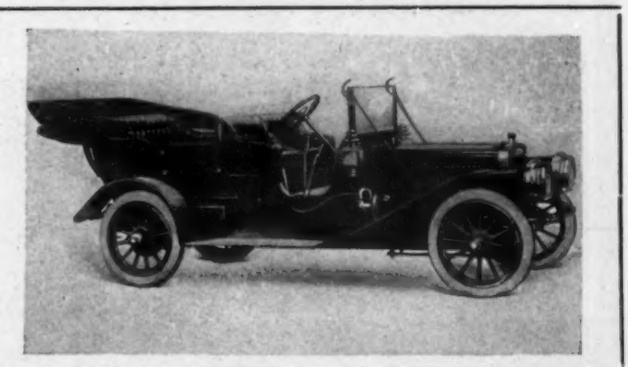
The Cleveland Show is bringing this class of purchasers to the surface, just as they were in evidence at Chicago, and probably as they appeared to some extent, at least, in all the shows of the year. This condition is the best evidence of the healthy growth of the automobile, and the extension of its use into the zone of practical application which is the highway to the greatest measure of stability. Until this condition could be measured, there were a great many autoists who labored under the impression that the automobile took on some of the phases of the bicycle, which proved to be a mere fad, and the life of a fad being limited, there were some who persisted in maintaing that this characteristic followed the automobile much as a spectre.

The automobile exhibitors are made up as follows:

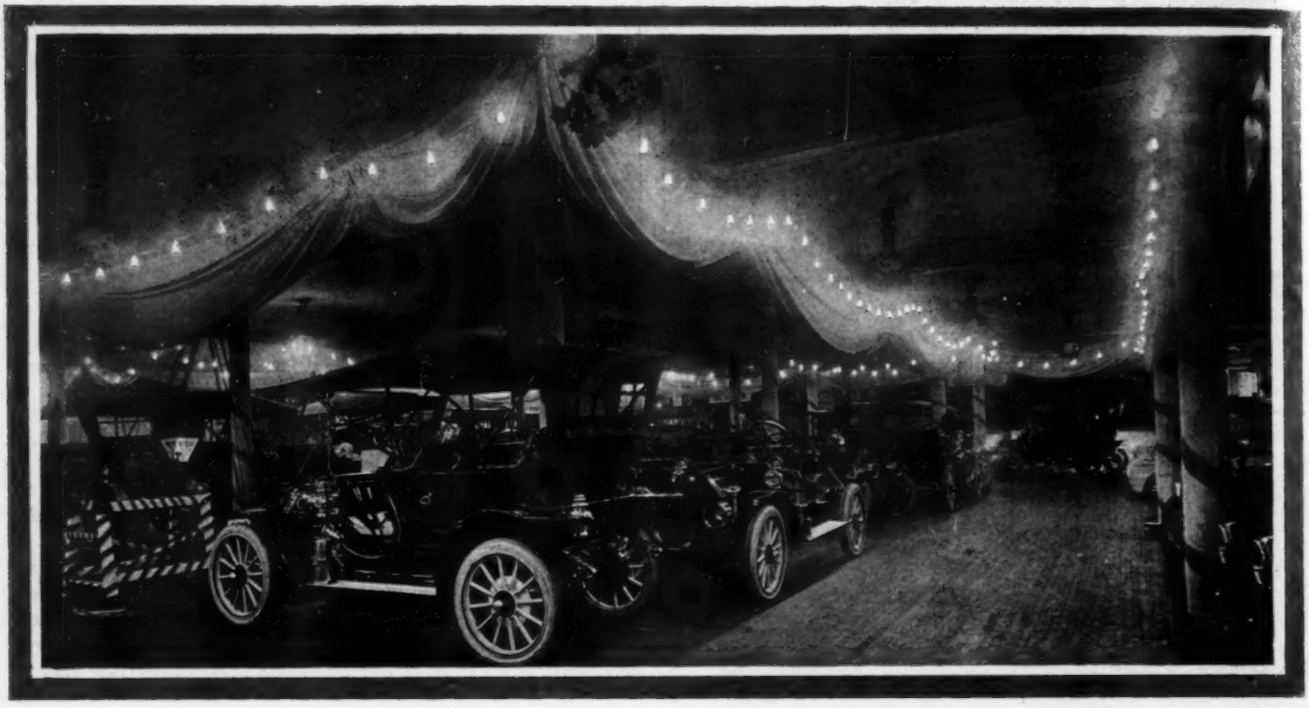
EXHIBITORS OF AUTOMOBILES AT CLEVELAND SHOW

Applebaum Brothers	Detroit Electric
Auto Bug Company	Auto Bug
Baker Motor Vehicle Company	Baker Electric
Chisholm & Phillips	Stevens-Duryea
Cleveland E-M-F Company	E-M-F
Chadwick Company	Chadwick
Derain Motor Car Company	Derain
Ford Motor Car Company	Ford
Gaeth Automobile Company	Gaeth
Hoffman Auto Company	Locomobile
Moore, H. S.	
Peerless Motor Car Company	Peerless
Rauch & Lang Carriage Company	Rauch & Lang
Royal Tourist Car Company	Royal Tourist
L. S. & M. S. R. R.	
Studebaker Auto Company	Studebaker-Garford
Standard Automobile Company	Standard
F. B. Stearns Company	Stearns
Sterling Motor Sales Company	Sterling
White Company	White
Winton Motor Carriage Co.	Winton
Simplex Motor Car Company	Simplex (American)

This show, despite the number of its exhibits, and the fact that it includes so many of the important makes of automobiles, is but one of the important events which will go to Cleveland for this year. The Eighth Annual Show of the Cleveland Automobile Club is yet to come. It is scheduled to open on March 5 and to run for seven days. It is commonly expected that the second show will be a record breaker, and if expectations in this connection are realized, Cleveland will take high rank.



Winton Model 48 Six-Cylinder Touring



General View of the Grand Rapids, Mich., Show, Illustrating the Decorative Scheme; Reo Occupies the Foreground

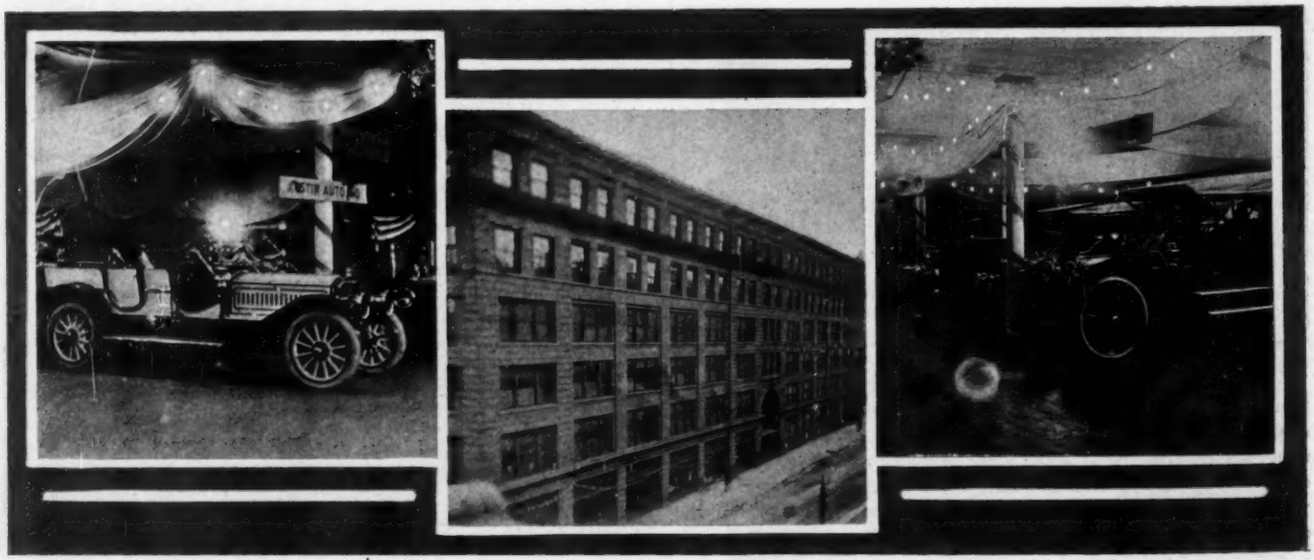
Furniture City Exhibition Attracts Attention

GRAND RAPIDS, MICH., Feb. 19—One of the largest buildings of Grand Rapids, devoted usually to the exhibition of the furniture for which the "Furniture City" is famous, is now devoted to the exposition of another of the country's great industries, namely, the automobile, and it is apparently attracting more attention than the finest products of the furniture field ever did. In short, Grand Rapids is having its first automobile show, and that it is an overwhelming success, is evidenced by the fact that ever since the opening night, when the aisles were literally packed, several thousand people have visited the show daily.

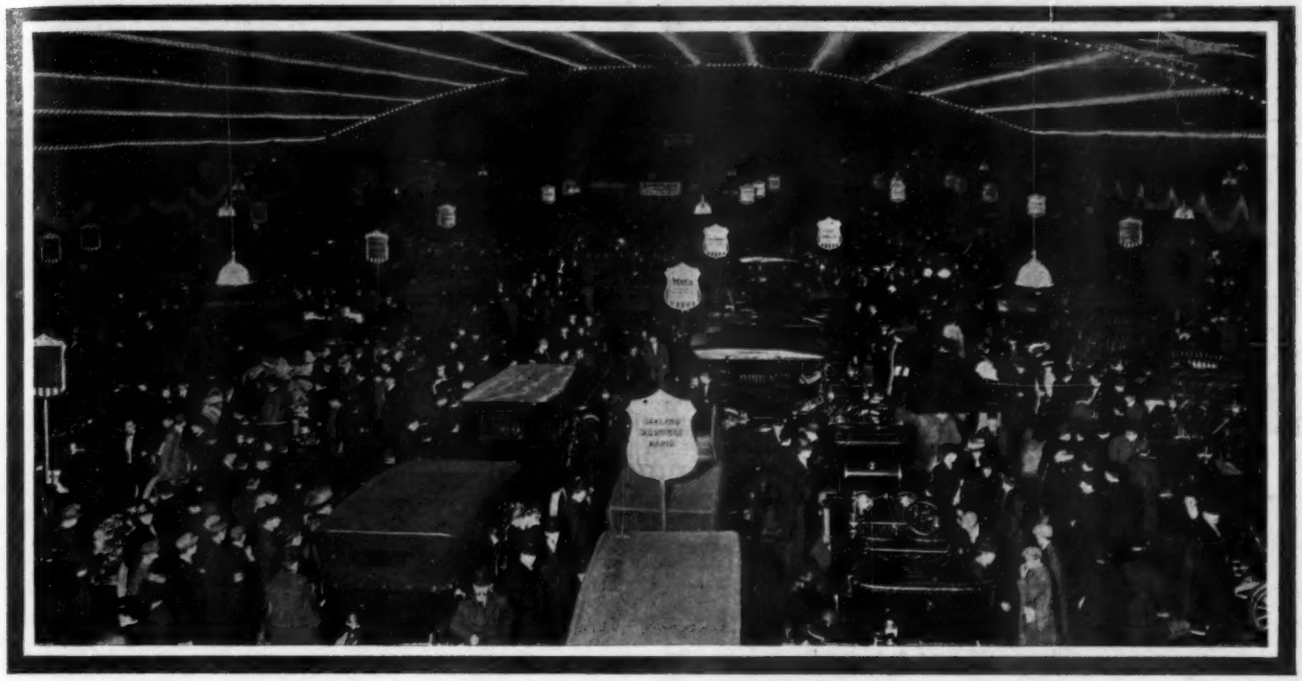
Although this was the first local show, the management seems to have learned the art, by the use of electric lights, bunting and flowers, of producing a beautiful spectacle. Festoons of electric lights and miles of pale green bunting outline the various exhibits, forming a pleasing color effect. Various arc lights, tastefully decorated with green leaves, add to the brilliancy of the scene, and in the center of the hall a large dome of electric lights has been placed. Palms and high bay trees have been used at intervals throughout the building to good effect, and the gallery set apart for the bands and orchestras is literally hidden from view with green stuff.

There are 31 exhibits in place, comprising 80 cars and requiring 30,000 feet of floor space. Pleasure cars predominate—in fact only four commercial cars were shown, these being light delivery wagons made by the Duplex Power Company, of Charlotte, the International Harvester Co., Buick Motor Car Co., and Angus Auto. Co., which makes the Fuller.

It was gratifying to see the large representation of Michigan-made machines. Especially prominent were the six-cylinder Austins, a native Grand Rapids product.



Left: Exhibit of Austin Six-Cylinders; Middle: Building in Which Show Was Held; Right: Pierce-Arrow Exhibit



Immense American Flag, Covering the Entire Ceiling, Was the Central Feature of the Buffalo Show

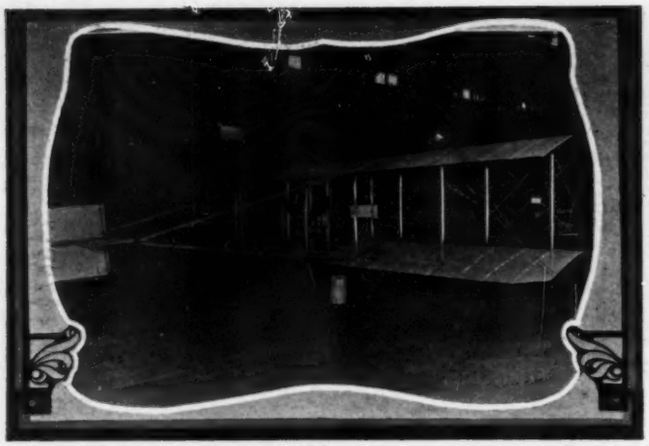
Buffalo Show Breaks All Attendance Records

BUFFALO, Feb. 19—All previous records in attendance and gate receipts were broken by the "Old Glory" Automobile Show, which closed to-night with the band playing "The Star-Spangled Banner." At the close, the 8,000 lights were turned out in the Stars and Stripes which gained the eighth annual automobile show of the Automobile Trade Ass'n its distinctive appellation.

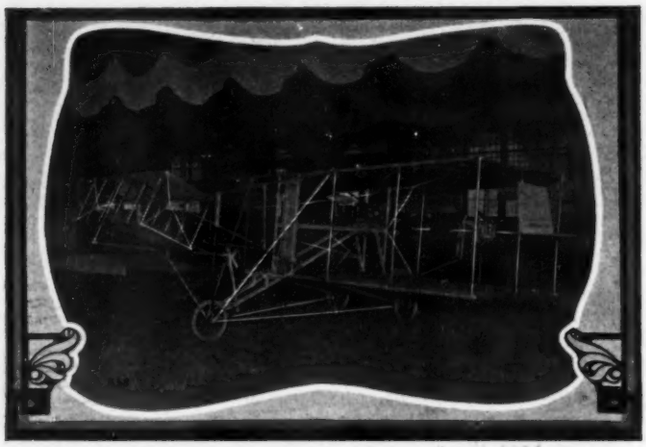
The total attendance for the week is estimated at 50,000. This is pronounced to be about 32,000 more than for the show of 1909. The attendance for the closing night was greater than that of any of the preceding nights, and a new record was set of a larger patronage on every succeeding night since Wednesday, instead of diminishing at the close as in former years.

It has been the consensus of opinion among exhibitors that there was never held here before so remarkable a show in point of sales. President Charles F. Monroe, of the Trade Association, and Secretary J. J. Gibson stated that upon a careful canvass it was learned that the number of cars actually sold and which could be attributed solely to the show was 152.

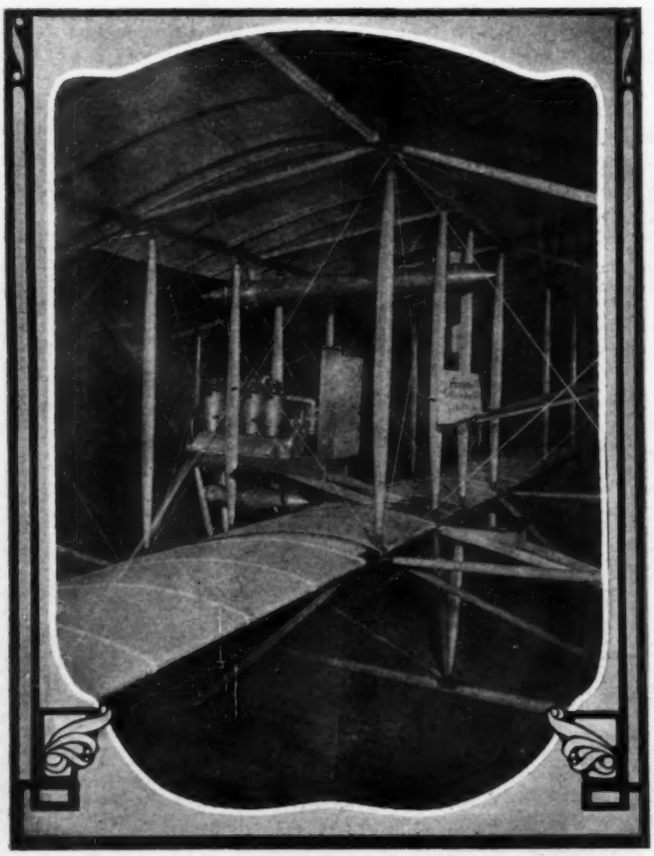
Buffalo Show Seen from the Gallery; Direction of View is Opposite from that of Upper Photograph



Herring-Burgess Biplane, of Neat and Workmanlike Design



Ericka Biplane, a Recent Springfield, Mass., Product



Near View of Herring-Burgess Machine, Showing Details

AERONAUTIC SHOW AT BOSTON

Chauvière Propeller, a Popular French Construction

BOSTON, Feb. 19—The first aeronautic show in America, with the possible exception of a small affair held in New York last Fall in connection with the Business Show, is now in progress in Mechanics' Building, completely filling the main hall. There are some fifteen full-size aeroplanes on exhibition, besides several gliders and any number of models and parts.

Exceptional among the other machines because of its perfect workmanlike finish was the biplane built for A. M. Herring, the former partner of Glenn Curtiss, by W. Starling Burgess, the yacht builder. Although following the lines of the biplane made familiar by Curtiss, this is said to differ in some important features, notably the apparatus for securing lateral stability. This, unfortunately, was not exhibited, the reason assigned being that it is not yet covered by patents. The landing gear of this machine consists of a single long central runner with two short spurs, one on either side, just under the main planes. Another unusual feature is its equipment with a four-bladed propeller, a type which few aviators believe in.

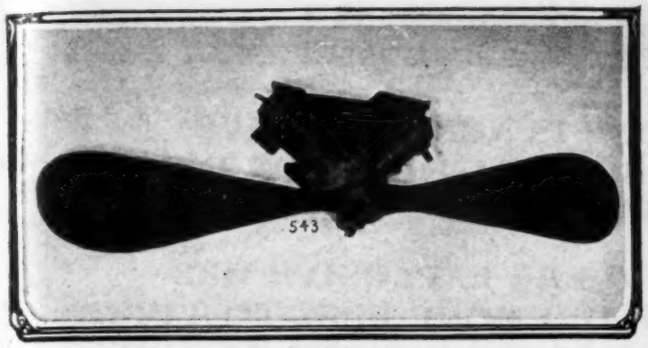
In its general construction the Herring-Burgess machine showed the effects of careful labor. The design of the framework is well worked out, attention being called to the manner in which two bars, starting from the front tip of the machine, extend backward to carry the aviator's seat and then support the motor on their rear ends. The vertical struts between the planes are well shaped, tapering at the ends where not so much stiffness is required.

One of the few monoplanes shown is the "Morok," made by a New York concern and offered for sale at a reasonable price. It is equipped with a four-cylinder 30-horsepower Harriman motor, weighing 315 pounds. The frame is of wood and tubing. Lateral stability is secured by a device often advocated in print, but never before, as far as is know, seen on a full-sized machine; that is, by sliding wing tips. These are two small planes, one at either end of the main plane; normally they do not project over the main surface, but they can be made to project at will, thus increasing the supporting surface on either side desired.

The only drawback to this method seems to be in the distribution of weight. Sliding out the plane on either side certainly increases the supporting surface on that side, but it also increases the leverage distance of the weight of the sliding plane itself; thus the efficiency of the surface must be considerably reduced.

The "Morok" follows standard monoplane design in having the propeller in front and the horizontal and vertical rudders in the rear. The planes are carefully trussed both above and below. The control resembles somewhat the Antoinette design, with two hand wheels; one controls the extension planes, and the other the horizontal and vertical rudders.

L. C. Erickson, of Springfield, Mass., shows the "Ericka" biplane, following rather closely the lines of the Curtiss machines. It has a triangular running gear, with three wheels, the single one being in front. The planes are 20 by 7 feet, very flat, with rocking auxiliary planes for the lateral control. These are actuated by the sidewise movement of the back of the operator's seat, following the natural swaying of his body. There is a double horizontal rudder in front, and a vertical rudder in rear, in connection with a rigid tail plane for stability. The framework is of bamboo and tubing. The motor is a standard auto-



Easton Eight-Cylinder Aeronautic Motor and Propellor

mobile design, of the Buick make, apparently taken bodily from a 22-horsepower Buick runabout; it drives a two-bladed wooden propeller at the rear.

The L. A. W. Motors Company, of Providence, R. I., shows a biplane equipped with a "L.A.W." motor, the initials, it is said, signifying the possibilities of the motor's use on land, air and water. This motor is a six-cylinder, two-cycle rotary, air-cooled. The cylinders are mounted radially about a central hub, with their heads to the center. The piston pins, instead of connecting rods, are provided with ball bearings of large size, forming rollers; these run around in a circular ring set eccentric to the cylinder hub. This eccentricity causes the pistons to move in and out of their cylinders as they rotate about their hub.

The inlet for the fresh gas is through the central stationary hub, which has a port which registers in turn with ports in the cylinder heads. Ignition is accomplished without any electrical apparatus, except for starting. In operation, each cylinder fires the one next to it by means of a by-pass through the central hub, which admits some of the burning gas into the cylinder just ahead. A single spark plug may be fitted into this port.

The biplane on exhibition at the L. A. W. stand has one of these motors mounted on pivots, in such a manner that its shaft, with the propellor attached, can be made to point upward or downward at will, and thus guide the machine.

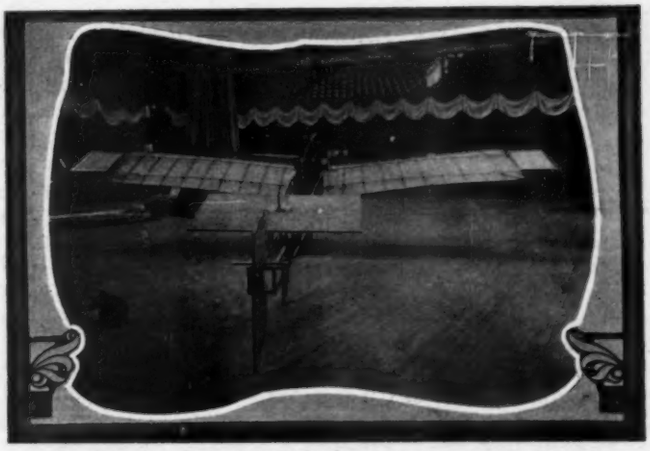
F. P. Shneider, of New York, has two craft on exhibition, one a 35 by 40-foot biplane after the Wright model, and the other a 30 by 35-foot Curtiss model. Stanley Y. Beach, also of New York, has two monoplanes, one on the Antoinette model and the other following Blériot lines. Other exhibitors of complete machines are the Aerial Exhibit Company, of New York; Elmer Burlingame, of Boston; Southworth & Merz, Brooklyn, N. Y.; Mr. Caines, of Boston; the Easton Cordage Company, Easton, Pa., and G. S. Haywood, of Hyde Park, Mass.

The lighter-than-air division is rather scantily represented. The spherical balloon "Boston," the property of the Aero Club of New England, is shown inflated. It is two years old, and during its life has made 45 ascensions, carrying 95 passengers; it has been in the air a total of 85 hours, covering 1,251 miles. Its capacity rating is 35,000 cubic feet. A. Leo Stevens, of New York, and the Boston Balloon Company also exhibited.

Among the parts and accessories most interesting is the Chauvière propeller, the make used by many French aviators. It is of laminated wood in six layers, very scientifically constructed, to secure great efficiency in air displacement. The Easton Cordage Company exhibited a special aero motor, eight-cylinder in V-shape, with a two-bladed wooden propeller directly mounted. The motor is of good design, departing from the automobile standard in but few respects. Valves are all in the cylinder heads with a single cam and rocker for each cylinder.

Models are almost innumerable, but those of the Harvard Aeronautical Society deserve mention. This body, composed of students and instructors at Harvard University, had on exhibition the planes of the biplane "Harvard I," which it is constructing, the glider "Naiad," and models of the Wright biplane and the Blériot monoplane. The Technology Aero Club, the Boston Y. M. C. A. and the International School of Aeronautics, of New York, also exhibited.

Biplane Following Wright Lines, Shown by F. P. Shneider



Morok Monoplane, with Sliding Auxiliary Balance Planes

L. A. W. Aero Motor and Propeller, Mounted on a Pivot

GASOLINE

ALONE IS NON-EXPLOSIVE
LIQUID WILL QUENCH A FIRE
CONTAINS NO OXYGEN AT ALL

WATER

FORMS AN EXPLOSIVE GAS
MAY ADD MORE FUEL TO A FIRE
CARRIES SUFFICIENT OXYGEN

STARTLING as these statements seem to those who accept the common prejudices against gasoline, they are nevertheless well substantiated. This unfortunate fuel is the most maligned and mistreated substance known to chemistry. It is commonly regarded as akin to nitroglycerin in its explosive qualities, to the extent that some people refuse to ride over a tank of it; at the same time it is splashed about carelessly in filling tanks, and allowed to run into drains and saturate wooden floors, and then blamed when it follows its natural tendencies.

Taking up these statements in order, first may be considered the explosiveness, or non-explosiveness, of gasoline. It is unfortunate that the engines in which gasoline is used should be so commonly miscalled "explosion" engines; their true name is "internal combustion." As this distinction indicates, gasoline never explodes, although it may burn with great rapidity and violence.

Properly speaking, an explosive is a substance which, without the help or presence of any other substance, may, by heat or concussion, be caused to undergo chemical changes which result in the production of gases of much greater volume than the original substance. The violent expansion of these resulting gases forms what is known as an explosion. The chemical change which results in the formation of these gases is oxidation, or burning; but if this is to be accomplished without the interposition of any other substance, as specified in the definition, the oxygen must be contained in the explosive substance itself.

The presence of oxygen in true explosives, such as gunpowder, nitroglycerin and its derivatives, the various forms of dynamite, may be seen from their chemical formulas appended herewith. (Oxygen is represented by O, hydrogen by H, carbon by C, potassium by K, nitrogen by N, mercury by Hg, sulphur by S, etc.) It is to be regretted that the formulas of nitroglycerin, guncotton, etc., are too complex to be of much use in this connection; but the explosion in all cases is the result of self-contained oxygen.

Gunpowder, a familiar explosive, may be taken as the example. It is a mixture of charcoal (carbon), sulphur and saltpeter; the latter, which contains the oxygen, forming about three-quarters of the whole. The chemical changes which form the explosion are the oxidation of the carbon, sulphur and potassium, and the liberation of free nitrogen; all the products, with unimportant exceptions, being in gaseous form. These gases occupy from 1,000 to 1,500 times the space of the original gunpowder, and consequently exert an enormous pressure on any vessel which contains them.

Now it remains to be seen whether gasoline should be classed with these explosives. In the first place, gasoline is not a definite chemical compound; it is the trade name for a mixture of various liquids known as hydrocarbons. In the United States these components are practically always of the methane or paraffin series, and hexane and heptane form the greater proportion. As a rule, the higher the "degree" of the gasoline, the larger the proportion of hexane and pentane; the lower the "degree," the larger the porportion of the heavier constituents. Commercial paraffin is composed of still heavier members of the series, which are solids; the lighter members, as methane and ethane, are gases. In England and on the Continent, where "petrol" and *essence* are sold in specially compounded brands, there is often an admixture of other hydrocarbons, given below under the heading "Suggested Fuels."

No great knowledge of chemistry is required to see that these hydrocarbons contain no dangerous amount of oxygen. In the case of ether and the alcohols the lone atom of oxygen is quite harmless among the greater number of atoms of carbon and hydrogen. It is obvious that for any oxidation of these fuels to take place, there must be some admixture of a second substance, in this case, of course, air, which is a mixture of oxygen and nitrogen. In the presence of air, these various hydrocarbons may oxidize into gases. The exhaust of a gasoline engine is composed of some 80 per cent. of nitrogen, taken in as air and left unchanged by the combustion; some 10 per cent. of carbon dioxide; and some 5 per cent. of oxygen and a residue of carbon monoxide, hydrogen, methane and miscellaneous hydrocarbon vapors, left by the incomplete combustion. These changes, although resulting in the formation of gases at high pressure, are quite distinct from the phenomenon known as explosion.

Gasoline in itself, therefore, is quite harmless; it is incapable of any chemical change except in the presence of oxygen, or some oxidizing agent. It is unfortunate, in one way, that air, the most common oxidizer, is quite universal in its presence; but even here the possibilities of combination of the two are not so great as might as supposed.

The operation of a gasoline engine depends on the evaporation of gasoline, the quality which causes it to break up into minute particles and mix with the surrounding air; and this evaporation takes place constantly at all ordinary temperatures. However, when evaporation ceases after it has proceeded to such an extent that the gasoline vapor (that is, the liquid particles) are 15 per cent. of the air which carries them (at a temperature of 60 degrees Fahrenheit). Air in this condition is said to be saturated. This is the condition which normally exists in a tank of gasoline, as carried on an automobile, or in a stationary tank in which air is used to force the gasoline out. Now it is an important fact that gasoline vapor in the saturated condition will not burn.

Neither will gasoline vapor considerably below the saturation point burn, nor again vapor extremely thin. The range of combustible proportions is very limited. From the saturation point, at which the volume of vapor is 15 per cent. of the volume of air, the proportion must be reduced to 5.5 per cent. of vapor, corresponding to one volume of liquid gasoline to 3,500 volumes of air, before the mixture will burn; and when the proportion falls below 2 per cent. of vapor, or one volume of liquid gasoline to 10,000 of air, the mixture again becomes non-combustible. The narrowness of these limits has been impressed on many an auto-

motorist who has striven long and anxiously to make his carbureter provide a combustible mixture. A large number of the stalled automobiles formerly so common a sight were mute witnesses to the harmlessness of gasoline.

A body of gasoline open to the air will be covered by strata of air in various stages of permeation with gasoline vapor. A layer immediately over the gasoline will be in a state of saturation; and from this the proportion of gasoline vapor will diminish gradually in all directions. There must, therefore, be somewhere in the vicinity of the gasoline a layer of air carrying the right proportions of vapor for combustion. A flame, or other sufficient source of heat, introduced into this layer will ignite it, with more or less disastrous results.

This layer of combustible vapor is the sole source of danger in connection with gasoline. The fact remains that the liquid itself and most proportions of its vapor positively will not burn. If poured on a fire gasoline will extinguish it just as surely as water will; the conditions to be observed are, of course, that the gasoline must be in sufficient quantity and applied quickly enough to reduce the temperature below the point of ignition of gasoline vapor, before that vapor has a chance to form. It has been proved by actual experiment that a lighted cigarette dropped into a can of gasoline will simply be extinguished.

Naturally, it is not recommended that gasoline be used to the exclusion of water for extinguishing fires, nor even that readers try for their own edification the experiment with the lighted cigarette. The "No Smoking" sign in garages should always be observed and rigorously enforced. The point to be made is that gasoline is dangerous only when the victim of rank carelessness and abuse.

Having now proved the three contentions made in behalf of gasoline, it may be edifying to consider the results of a careless use of water, apparently the most innocent of substances. In the first place, water is an ingredient in the manufacture of a combustible gas as dangerous as the vapor of gasoline, namely, water gas. When suitably enriched with hydrocarbon vapors, this is frequently used as illuminating gas, in place of coal gas, as it is cheaper to manufacture. The process consists, in brief, of forcing water, or steam, through a red-hot mass of coal. The water is broken down and partially unites with the carbon of the coal, forming a mixture of carbon monoxide and free hydrogen. When ignited, this oxidizes into carbon dioxide and water vapor.

A gas plant is by no means necessary for the formation of this gas, as any municipal fire department will witness. Any form of carbon will do to replace the coal, and water, if the temperature is sufficiently high, will quickly furnish the steam. In the case of burning buildings, dangerous "back flares" frequently result.

Newspaper accounts of garage fires and burning cars usually contain some line to the effect that "the gasoline tank exploded with frightful violence, scattering the flaming liquid in every direction." Here the distinction has been neglected between the explosion of the tank and the explosion of the gasoline. If the above arguments have been followed the reader should have no remaining doubts as to the impossibility of the latter. A tank of gasoline, however, can explode in the same manner that a steam boiler can. The heat of the surrounding fire, in the case of a burning car or building, will vaporize and expand the gasoline in the tank, and unless the means of escape are sufficient, the pressure thus generated will cause the tank to burst with considerable force. The dispersed vapor is then in a favorable form to mix with the suitable proportion of air and catch fire.

In the handling of gasoline the cardinal principle to be observed is to prevent vaporization if possible, or at any rate to keep the vapor in the saturated condition. Standard forms of gasoline storage tanks keep the part of the tank not occupied by gasoline full of water. As the two do not mix, the gasoline, which is the lighter, remains in the upper portion of the tank, and cannot form vapor. Pumping in more water forces the gasoline out, as required.

For automobile tanks this idea has not been found practical. In the gravity-feed type of tanks a vent-hole is provided which admits air as the gasoline is used up; in pressure-feed tanks air, or exhaust gas, is forced in to force the gasoline out. Whenever air fills the part of the tank not occupied by gasoline, it becomes saturated with gasoline vapor, and so is harmless. The danger comes in the filling of the tank, when a quantity of this saturated vapor must be ejected from the tank and allowed to mix with the outer air. This is the time when the match and the cigarette get in their best work.

Methods of extinguishing gasoline fires are quite commonly known. Water must never be used; in the first place, it does not put out the fire, and in the second place it makes it worse. The latter is because gasoline floats on water, and so is spread out in a more favorable form for vaporization. Sand and earth, on the other hand, absorb the gasoline and prevent its vaporization. Wood-pulp is one of the best materials for absorbing gasoline, and has been recommended as a filling for all storage tanks. It will absorb 55 per cent. of its own volume of gasoline, and thus absorbed, the gasoline is absolutely harmless.

In laying down rules on any subject it is always better to have the reasons well understood; when chauffeurs and garage men thoroughly understand the nature and properties of gasoline, rules for its handling will be less needed. In some directions improvement in the construction of automobiles will be of avail. When the carbureter that needs no priming is invented, and all dust pans may easily be taken off for cleaning, one considerable source of danger will be removed. The custom of drawing off gasoline from the tank for cleaning purposes should also be discouraged; not only is it expensive, but it usually results in the scattering about of gasoline-soaked pieces of waste. Non-explosive though gasoline may be, care in its handling is never wasted.

CONSTITUENTS OF GASOLINE
Liquids of the Methane Series

General Formula	C_nH_{2n+2}
Butane	C_4H_{10}
Pentane	C_5H_{12}
Hexane	C_6H_{14}
Heptane	C_7H_{16}
Octane	C_8H_{18}
Nonane	C_9H_{20}
Decane	$C_{10}H_{22}$

OTHER SUGGESTED FUELS
Various Hydrocarbons

Ethyl Alcohol	$C_2H_5.OH$
Methyl Alcohol	$CH_3.OH$
Benzene	C_6H_6
Toluene	C_7H_7
Hexahydrobenzene	C_6H_{12}
Hexahydrotoluene	C_7H_{12}
Ether	$(C_2H_5)_2O$
Acetylene	C_2H_2

SOME EXPLOSIVE SUBSTANCES
Various Compounds and Mixtures

Black Gunpowder C+S+KNO_3 (10 to 15 per cent each carbon and sulphur, 70 to 75 per cent saltpeter).
Picric Acid $C_6H_2(NO_2)_3.OH$.
Ammonium Nitrate NH_4NO_3.
Nitroform $CH.(NO_2)_3$.
Mercuric Fulminate $Hg_3C_2N_2O_2$ (used with KNO_3).
Nitroglycerin, Guncotton, Celluloid, Collodion and other explosives are similarly formed, all containing their own oxygen.

STANDARD FOUND BY AVERAGING 1910 CARS

CONCERNING the advanced mechanical features which prevail, and those which are not advanced but of interest, it will serve well the purpose to tabulate and average the differing features, basing a keen analysis upon such tabulation. Taking as a basis of this tabulation and analysis the three big shows, namely, the Palace and Garden in New York and the Chicago Show, will have the merit of arriving at a result at once. This process, on the other hand, will have the disadvantage of counting in some cars twice and thus accentuating their mechanical features. But, to look at it otherwise, the total number of exhibitors at these three shows tallies almost exactly with the total number of builders now existing in this country, so that at the risk of a slight—a very slight—amount of accuracy this method at once arrives at an equivalent average for all cars built in the country. In other words, the exhibitors showing for the second time just exactly balance those who did not exhibit at any one of the three shows.

The appended table, then, gives what might be called, for want of a better name, the four standard American cars. Four are obtained by following the price classification which has hitherto been followed in similar tabulations. That is to say, the cars as a whole have been divided into four great price classes, namely, all cars below $1,000 in price; all cars listing at approximately $1,500; all cars above this, but not exceeding in price $2,500, and, finally, all cars above this figure, which latter selection has been labeled the $4,000 class because of the close approximation to this figure in the average.

FOUR AVERAGE CARS OF 1910 TAKEN COLLECTIVELY.

Classes	$1,000	$1,500	$2,500	$4,000
Wheelbase In.	96	109	114	124
Wheels, Front	31.0	33.3	33.8	35.6
Wheels, Rear	31.0	33.3	34.2	35.7
Price of Car	$867	$1,412	$2,161	$3,849
Motor				
Cylinders—One	2.8			
Two	29.4	4.8	1.3	
Three				
Four	67.8	93.5	89.1	61.1
Five				2.6
Six		1.6	9.5	36.2
Average Bore	3.92	4.17	4.32	4.77
Stroke	4.19	4.46	4.76	5.13
Ratio	1.070	1.070	1.101	1.075
Formula Horsepower	20.4	26.8	31.1	45.4
T type Cylinders	7.7	9.8	18.7	41.4
L type Cylinders	87.0	82.2	57.7	35.6
Overhead valves	5.3	8.0	11.0	21.6
Cyls. Cast—Indiv.	56.9	54.9	36.6	34.2
Pairs	7.7	24.3	56.6	65.1
Block	35.6	20.7	6.6	0.6
Water Cooled	91.8	93.4	95.3	95.1
Thermo	67.2	34.6	20.6	4.9
Pump	24.9	57.9	74.4	90.2
Air Cooled	8.2	6.6	4.7	4.9
Ignition—H. T. Single	63.0	22.5	27.6	10.4
Dual	26.5	42.1	32.4	46.1
Double	10.0	35.3	38.5	39.0
Make and Break				3.5
L. T. Single			1.4	1.5
Carbureter—Gravity	100.0	87.3	90.3	60.2
Pressure		12.7	9.6	39.7
Lubrication—				
Compression Oiler	2.6	1.6		
Pump	62.4	75.6	66.5	64.4
Gravity Pump	8.2	6.6	1.5	
Mech. Oiler	16.1	11.2	26.6	35.6
Flywheel Circ.	8.2	4.9	5.3	
Clutch-Mult. Disc.	53.6	47.9	45.4	48.2
Cone	38.3	47.1	33.0	40.8
Exp. Band	2.6	1.6	12.2	3.8
Contr. Band			8.1	4.6
No Clutch	5.0	3.3	1.3	2.6
Transmission—Sel. 2	13.2		1.3	
Sel. 3	19.3	64.0	87.8	51.9
Sel. 4		1.6	3.3	41.6
Prog. 2	19.3	3.3		
Prog. 3	2.6	3.3	4.7	3.9
Plan 2	44.3	21.0	1.4	
Plan 3		3.3		
Friction	5.0	3.3	1.3	2.6
Drive-Shaft	81.7	88.5	97.3	91.8
Chain	18.3	11.5	2.6	8.1
Weight	1,229	1,939	2,283	3,192
Weight per Horsepower	60.2	72.3	73.4	70.3
Horsepower per 100 Lbs.	1.66	1.38	1.36	1.51
Price per pound	$.705	.728	.946	1.205
Price per horsepower	$42.50	52.69	69.48	84.78
Pounds per dollar	1.49	1.37	1.06	.83
Power per dollar	.0235	.0190	.0144	.0118

American cars as a whole, then, would be divided into four groups, and their mechanical features would average up to the figures given in the table, these being expressed in percentages of the whole number in the group where possible, and otherwise in exact averages.

It will also be pertinent to the discussion of the features of American cars as a whole to consider the exhibits at the three shows as three separate groups, each with its own average. Considered in this light, it will be possible to sketch out wherein each one of these three groups of cars has influenced the final average, and wherein it has been influenced by the other groups to make up the final average.

That this is pertinent to the subject is shown by a single instance. Thus, in the oft-discussed matter of ratio of bore to stroke: At the Palace show the cars in the $2,500 class had an average bore of 4.41 and an average stroke of 4.89, giving an average ratio of bore to stroke of 1 to 1.108, thus showing that this class of makers does not incline very forcibly to the lengthened stroke. Then at the Garden show, in the same price class, the makers average up to 4.2 bore and 4.6 stroke, a ratio of 1 to 1.095, showing that this group of master builders inclines even less to the long stroke than does the previously mentioned class. At the Western show the averages were 4.35 bore and 4.80 stroke, a ratio of 1 to 1.103. This is neither the largest ratio nor the smallest, and when all three are compared with the one given in the all-American table, 4.32 bore by 4.76 stroke, a ratio of 1 to 1.101, it is seen that the Palace show brought the average up, while the tendency of the Garden show exhibitors was to bring it down. The Chicago show, on the other hand, simply served as a balance, neither raising nor lowering it.

After this brief excursion into the probity of this method of classification of the cars, it will be well to examine into the results which the method gives.

The crying need of the country to-day—that is, in the automobile business—is for standardization, not alone of the little things, some of which have already been slightly investigated, but also of the big things, such as cylinder sizes, wheelbase, tires per effective power or per given weight of complete cars, size of shafts to carry a given power when a specified material is used, size of axles, and a number of others. These have as yet not even been dreamed of by automobile builders, and when this is brought to their notice they will doubtless say that such a move will take away all originality. In reply to that unspoken argument, it will suffice to call attention to the electrical standardization methods, which have penetrated even farther than this in a business of equal or greater bigness. More than that, now that it is done, every electrical manufacturer in this broad land is glad of it; his worries are lessened, his supplies are minimized in number, he carries a lessened number of parts in stock. In these and many other ways, which lack of space prevents mention of, the business as a whole, although it resisted the work at first, is now bigger, better, healthier for the change. So it would be, and in fact must be, with the automobile business, and that, too, at a time now not very far distant.

As for the accompanying table, and the matter to follow, these simply represent what might be called the existing attempts at a standard, representing as they do an average of all the cars now made in this country. Viewed from that slant, it will be well to look into the details. Four standard cars, so-called, are given. These were selected according to price classification, the four divisions being made up to $1,000, from $1,000 to $1,500, from $1,500 to $2,500, and all above the latter figure.

In the first or $1,000 class the wheelbase is 90 in., the wheels are 31 in. in diameter all around, and the average tire size, not given in the table, is 3.2 in., or approximately 3 1-4. The price of this car averages to $867.

Passing next to the so-called $1,500 car, the wheelbase is 109

in., the tires are 33.3 in. in size all around, or approximately 33 1-2 in. In price the average strikes $1,412. Next above this, the wheels are 33.8 in. in front, and here is seen the first difference, the first appreciation of the differing work of the two sets of wheels, the rears being 34.2 in. These two are taking the nearest even fractional figure 34 in. fronts and 34 1-4 in. in the rear. The price average is $2,161.

The last or highest class has a wheelbase of 124, in which respect attention is called to the fact that the increment of wheelbase in the four classes is very close to 10 in. per class, the closeness of price of the two middle classes being the cause of the only wide divergence from this. Here the wheel sizes again show a difference, fronts being 35.6 in., roughly 35 1-2, while rears are 35.7, roughly 35 3-4 or 36.

Passing on to the motor details, the number of cylinders is given the preference as to position, since this represents the real thing for which the money is paid—that is, other things being equal, no man would pay the same money for a one-cylinder car as for a four-cylinder machine, choosing the multi-cylinder every time. In the fact that other things are not equal lies the claim for business of the makers of a lesser number of cylinders than six, the greatest number now in daily and constant use.

The good old single-cylinder horizontal is a thing of the past, the Cadillac, Reo, Buick and others which have made this type world-famous having been discontinued. In their place, but few single-cylinder automobiles are now built, foremost among which may be mentioned Brush, with a single cylinder engine, but set vertically. To compare with the many excellent, fast and durable French, German and English single-cylinder runabouts, there is not an American motor car on the market to-day. While Brush and the others, taken collectively, make up but 2.8 per cent of the whole number of makers, Brush alone on the basis of this year's production will amount to nearly 5 per cent of the estimated total production, this Detroit maker having figured on an output of 10,000 cars for the year 1910.

Passing on to the two-cylinder engine, it is found that this type of prime mover is comparatively popular in the lowest priced class, amounting as it does to the comfortable total of 29.4 per cent of the whole number. It would be interesting to find out just how much of this figure is given over to the two-cylinder vertical and how much to the two-cylinder opposed. It is doubtful if any of these cars uses a two-cylinder inclined motor, a type which has met with little favor on this side, although comparatively popular abroad for low-priced cars. The rest of this class is made up of four-cylinder engines, the exact figure being 67.8 per cent. When the price is considered, averaging $867, this really is an astonishing fact, for the rate of value per dollar expended is so much greater than was the case but two years ago as to cause wonderment. That quantity production has had much to do with this is self-evident, as is also the machine tool builder's part in it. Without many of the very latest up-to-date machines, fully automatic in their action, this sort of a thing would be impossible. This figure shows, too, that the man who is waiting to buy an automobile "when they get cheaper," basing this on the ratio of value in the bicycle, is badly off, for there will never be a time when the actual value per dollar invested will be greater than to-day, considering the manufacturer's profit at a fair and equable rate. In the connection of value with result, it might be called to the attention of the reader that the aforementioned car, which sells very much below the average, has done much to pull the aforesaid average down to this low level.

Power always interests, as does the source of it, so the cylinder sizes interest, too. In this low-priced standard car the average bore, considering all engines, one, two and four cylinders, on an equal basis, is 3.92 in., while the bore is slightly larger, 4.19 in. The nearest fractional sizes come in sixteenths, but expressed in millimeters, this engine would be 100 by 106. The formula power would amount to 20.4, or in even numbers 20 horsepower. Attention is called to the ratio of bore to stroke, this being but 1 to 1.070, or very little more than an even bore and stroke. In this again we find little or nothing to compare with the long stroke voiturettes of abroad, with the stroke running from 1 1-2 up to 2 times the bore.

Passing along to the points of design, the L type of head is preferred by no less than 87 per cent of the makers, while the T head and the overhead-valve type divide the rest, these being nearly on a par as far as numbers are concerned. This landslide to the valves-all-on-one-side engine is explained in part by the lower cost of foundry work and the decreased cost of the final engine, due to the elimination of one camshaft and the lessened machine work on both cylinders and crankcase in this type.

Of vital interest to the foundry, although having a big bearing upon the design as a whole, is the shape and size of the cylinder casting. That is to say, whether it is of a number of individual castings, one for each cylinder, a smaller number of pairs, that is, two cylinders cast as one, cylinders in threes, or cast in a block. The smallest car shows a predominance of the single cylinder castings, although in this, the matter of cost, as exemplified by the type of cylinders is reversed, the mostly used individual castings costing more per engine in both the foundry and machine shop than the cylinders in pairs. Next in order, numerically, comes the block casting. Evidently the swing of the pendulum has been away from the single casting of late, the large number in the older class represents the older makers, while the newer form of construction attaches itself to the newcomers. At any rate, it is a surprising fact that next to the single castings in order of popularity comes the cylinders cast in a block. The percentages of the two are respectively, 56.9 and 35.6, leaving but 7.7 per cent for the paired castings, or as they were once called, siamesed.

Air versus water for cooling purposes is settled by the percentages, which are 91.8 for water and 8.2 for air. Excepting only gravity feed to the carbureter, there is the biggest percentage given to any one feature in the whole list, with the single exception of the higher priced cars, on which this same percentage is increased slightly. As for the water cooling, itself, this is separated into the two schools, those favoring the natural or thermo-siphon method of circulating the water, and those who stick to the pump for driving the water. In this priced car, where first cost, simplicity, and small number of parts are all large and weighty points upon which to hang a selling argument, it is to be expected that the simpler system would predominate, which it does by the large percentage of 67.2. The other method has many followers, however, as is shown by the number, 24.9 per cent.

When it comes to ignition, there is no such unanimity, three systems of wide divergence dividing the total number of makes. These with their percentages are: high tension single, 63.0; high tension dual, that is, magneto used as a timer for the battery current, some one feature thus being utilized in both systems, 26.6, and finally, double or two separate and distinct systems, 10.0. Considering the price of the cars in question, the latter is a source of wonderment, that is, from the viewpoint of how the manufacturer is able to do it.

One might reasonably expect that none of the cars in this class would have pressure feed from a rear gasoline tank to the carbureter, this being both expensive and complicated. Such is the case, the gravity feed being set down at 100 per cent, or on all cars in the class.

In the matter of lubrication, the makers begin to show less of standardization than has been shown in previously discussed features. Five methods of lubrication are listed, and each one of these has a following, somewhat limited in some cases, it is true, but nevertheless, adherents. To mention the five and their respective percentages: compression oiler, 2.6; circulating pump, 62.4 by far the largest, and also, the only close approximation to a standard; gravity feed from a container, which is kept filled by a pump, 8.2; mechanical oiler with numerous leads, 16.1; and flywheel circulation of the oil, that is to say, splash, 8.2.

Under the heading of clutches, while five different kinds are mentioned, but four have friends among the very small car

makers. These show considerable unanimity, in that two types together make up 92 per cent of the whole. These are: the multiple disc with 53.6 per cent and the cone clutch with a following of 38.3 per cent. The rest is divided into: expanding band, 2.6 per cent, and no clutch at all (friction transmissions) 5.0, while the contracting band is not used.

One might expect—and with good reason—that the cheaper to build planetary transmission would be found strongly intrenched in this class, yet such is not the case, emphasizing the "value for money" previously spoken of. Two and three-speed selective gears together total 32.5, while the four-speed gear is not used. Then the two and three-speed progressives add their quota of 21.9, making about 55 per cent. This with the 44.3 planetary and 5.0 friction makes up the whole.

Shaft drive is very much in the majority, which is all that can be said, the chain-driven variety having the handsome total of 18.3 per cent. Coming down to the weight, this is somewhat difficult to ascertain with accuracy, but a figure is given. This is but slightly over 1,200 pounds, which amounts to the very low figure of 60 pounds per horsepower, or put otherwise, 1.66 horsepower per every hundred pounds of dead weight. As to cost of power, and weight, the former works out to $42.50 per horsepower, while $.705 seems to be fair per pound.

Passing to the next larger model, the more popular $1,500 machine, the opinion as to number of cylinders has increased, nearly all makers fitting four, to be exact, 93.5 per cent. In the still larger model, an increasing loss to the sixes is noted, so that the number of fours falls to 89.1, this increasing along the same lines to 61.1 fours and 36.2 sixes, in the largest car. The same gradual but noticeable increase in bore and stroke is noticed, the ratio of the two remaining practically near 1.1.

Cylinder shapes show a gain in T heads and overhead valves, both at the expense of the L head, so that the latter becomes in the three larger models: 82.2 per cent, 57.7, and 35.6, losing the lead in the latter case to the T head. Similarly paired cylinders gain at the expense of both block and individual cylinders, the former in fact practically disappearing in the highest priced car. Cooling as to air versus water stands in about the same ratio, with a very slight gain in favor of water. As to the method, however, the simpler thermo system loses ground constantly. Ignition is mostly by the systems which permit of a choice of two, dual and double together amounting to nearly 90 per cent. In this, the more expensive cars show a few, a very few evidences of the low-tension system. Some increase in pressure feeds for the fuel is noted, but this is a variable, rising only to drop again, going on up the scale. Lubrication, too, shows a peculiar variation, but the mechanical oiler of multiple leads, and the pump circulating scheme, as more satisfactory and positive, show a continuous increase. In clutches, the diversification, which gives the advocate of standardization much to talk about, is very noticeable, the two leaders in the small car class both losing in favor of the expanding band, contracting band and friction transmission.

Transmission trend is shown in the overwhelming number of selectives as against all others combined, this figure being nearly 94 per cent. Strange to relate, chain driving loses ground rather than gains, the percentage dropping from 18.3 for the smallest car to but 8.1 for the most expensive, reaching a still lower point of 2.6 for the $2,500 car.

Weight, of course, increases, but slightly faster than does the power, as shown in the figures of weight per horsepower, and horsepower per hundred pounds, the latter in particular showing the high relative power of the very small, extra light cars and the very large and heavy cars. Price goes steadily upward, whether it be total, price per pound, or price per horsepower. It would seem, at first thought, that the two latter would be quantities which would remain fairly stationary, but such is far from the case, the price per pound going steadily up to over one dollar in the big cars, while for the same class the price per horse-power reaches the top-notch figure of nearly $85.

While not actually presenting the four standard American cars, because there are no such things to be presented, this table and the remarks upon it give some food for reflection, incidentally pointing out more strongly then ever the need for standardization, the universal standardization which will give a similar weight, power and ability for the same amount of money.

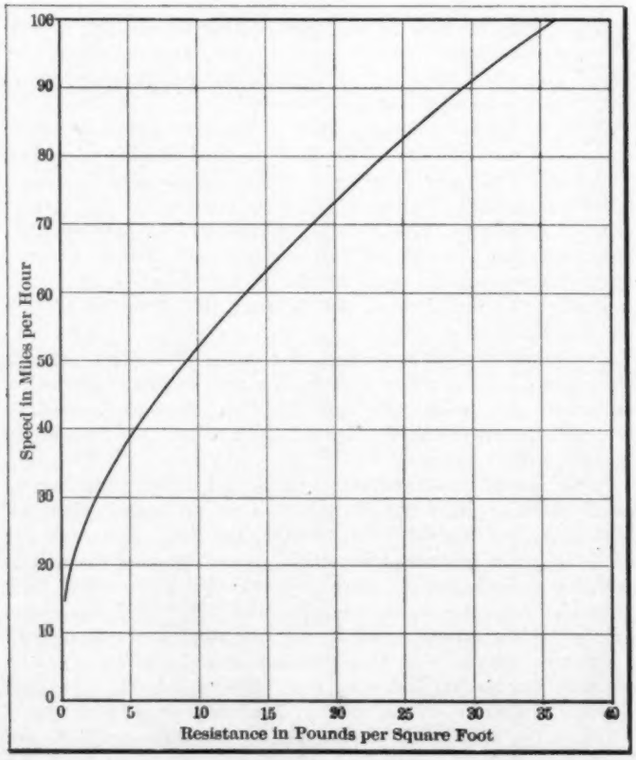


Chart Plotted to Show the Increase in Wind Resistance with Speed

EFFECT OF WIND AND AREA ON SPEED

At speeds below twenty miles per hour the effect of wind resistance, so called, is below the noticeable point when an attempt is made to measure its magnitude. Considering surfaces at right angles to the normal plane of travel of the automobile, the wind resistance, as measured in pounds per square foot, while it begins to show at about fifteen miles per hour, raises slowly, reaching about 2½ pounds per square foot when this speed is doubled. Further increases in speed result in a rapidly increasing rate of resistance to travel as measured in pounds per square foot, and at 60 miles per hour this effect is slightly over 13 pounds. Increasing the speed again up to ninety miles per hour increases the effect of wind resistance so that it is represented by the considerable figure of 29 pounds per square foot, approximately. The curve here given shows the results of tabulation involving these factors and illustrates the necessity of treating with this question of front area.

There are two possible remedies in an attempt to reduce the ills of wind resistance, one of which lies in the greatest possible reduction of front area, and the other involves wedge shapes and a smooth exterior. If cooling depends upon a radiator in front, the area of the radiator exposed is, of course, regulated by the cooling requirement. A certain amount of air must brush against the cooling surfaces, so that the air molecules will sponge heat out of the cooling water as fast as it is enabled to penetrate the walls. The ability of the radiator is increased with the speed of the car up to about twenty miles per hour, but beyond this point front area, from the cooling point of view, is not a factor. The front area, as regulated by the radiator, therefore, must be such as to permit a sufficient weight of air to brush over the cooling surfaces at a speed of twenty miles per hour.

EFFECT OF HEAVY CHARGING ON PASTED LEAD PLATES*

By HUGH RODMAN

SUCH plates, in service, and not subjected to abuse, fail by reason of the active mass softening and silting from the face of the plates to the bottom of the jar. This disintegration is probably due to one of three main causes:

First. An untangling of the set, crystalline mass due to the cycle of changes from peroxide to sulphate and back to peroxide, to which a portion of the active material is subjected with each charge and discharge.

Second. To solution of the set, crystalline lead compounds and precipitation thereof as loose pulverulent compounds. This follows from the formation of concentrated sulphuric acid in the pores of the plates during charge, this dense acid dissolving lead sulphate and reprecipitating it upon contact with the diluted acid at the surface of the plates.

Third. The solution of crystalline lead compounds and reprecipitation as non-crystalline compounds, due to the formation of persulphuric acid at the surface of the positive plates during the gassing period.

The first source of trouble may be helped in two ways, by less frequent charging and by starting with more thoroughly set or crystallized plates. It is obvious that with a battery capacity of forty miles and a ten-mile run on two successive days, if the charge is deferred until the end of the second run the active mass will have been subjected to one cycle of change of crystallization instead of two cycles, which would have followed recharging after each partial discharge.

The solution of lead compounds by dense sulphuric acid may be partially overcome by the use of thin and porous, rather than thick and dense plates, thus giving the sulphuric acid formed during the charge a chance to mix more easily with the dilute, free acid outside the plates. Slow charging will, obviously, serve the same purpose.

The disintegration, due to persulphuric acid, may be lessened by infrequent, complete gassing charges. It is generally believed that the gassing charge must be given occasionally, but there seems to be no necessity for doing so more than once in, say, two weeks. Certainly it is harmful to gas the plates freely at the end of each charge.

Altogether the best scheme of charging, suggested by theory, is: First, to charge at a moderate rate; second, to recharge only after several partial discharges; third, to give the gassing charge only occasionally.

These conclusions are fully borne out in practice. The life of batteries is increased by moderate charging, say, the four-hour rate to begin with, and half that rate at the end of the charge. Longer service is secured by infrequent charging. It is not difficult in most installations to defer charging until after several partial discharges, provided these discharges have not stretched over too long a time. A charge following two or three partial discharges on successive days is far better than a charge following each partial discharge.

Fairly complete charges, say, up to 2.4 volts per cell with the current equal to about half the four-hour rate of discharge, gives longer life to plates than where gassing follows each charge.

*Paper read at the semi-annual meeting of the Society of Automobile Engineers, New York City, January 4 and 14, 1910.

MAXWELL SAND BLAST CLEANING PROCESS IN DETAIL

THE refinement of the old-time sand bellows, the modern compressed-air sand blower, is used by the Maxwell-Briscoe Motor Company in cleaning and smoothing various machine parts and particularly in preparing the steel bodies of Maxwell cars for the painter's brush.

In order to free the surfaces from all traces of oil, rust, etc., they are subjected to a blast of fine sand, which is driven against the hard metal with great force. The abrasive action thus set up removes all slight inequalities and results in a surface of ideal smoothness. In order to make it impossible for sand to enter the workman's lungs he is attired in an air-tight helmet into which air is pumped from an outside reservoir.

In the illustration the workman may be seen sanding one of the transmission gears, the tank for the air, with its pipes and gauges being clearly visible behind him, in the corner of the room. The latter, it will be noted, is of very cheap construction, as it would not be advisable to have it otherwise, the sand not being particular about automobile parts, but attacking buildings when properly directed toward them just as readily.

The sand blast is the invention of B. F. Tilghman, of Philadelphia, and made its first appearance at the American Institute Fair, in New York City, 1871. The material used may be common sand, powdered quartz, emery, or any similar substance composed of hard and sharp particles, and may be blown by a blast either of air or of steam. A jet of sand impelled by even the blast of an ordinary fan will give glass a "frosted" finish in a few seconds and will cut wood quite rapidly. With a jet issuing under 300 pounds pressure a hole can be cut through a piece of corundum, the material used in grinding wheels, 1 1-2 inches thick, in 25 minutes.

With the expenditure of 2 horsepower in compressing air, 2 square feet of scale on the surface of ordinary steel plates can be removed per minute, the surface being then ready for galvanizing or painting. A hundred pounds of castings can be cleaned in 10 or 15 minutes with a 2-horsepower jet.

Maxwell Sand Blast Operator At Work on Small Castings

INCRUSTATION DEFEATS COOLING

RADIATORS, however efficient they may be when they are new, become fouled by foreign matter which is suspended in the water when it is put into them, and, if the radiators are not large enough properly to cool the motors without evaporating water, it is but a matter of a short while when the accumulation of foreign matter will be sufficient to defeat efficient cooling,

Elimination of Impurities from Water

(A) For sediment; filter or blow off.
(B) Bicarbonates; add caustic soda and boil water before use.
(C) Sulphates; add barium chloride and settle.
(D) Grease; add slacked lime and filter.
(E) Organic matter; precipitate with alum and filter.
(F) Carbonate of Magnesia.
(G) Carbonates; add barium chloride and settle.
(H) Chlorides; add carbonate of soda.

Note.—The proper time to take advantage of any of these processes is before the water is placed in the cooling system; once the surfaces are coated over with a hard crust, they will be beyond cure. Chemicals will damage the radiator.

even assuming that the trouble may not extend to the point which will induce knocking and pre-ignition.

If a radiator is so efficient for its purpose that water will not have to be added to make up for that which boils away, the quantity of impurity which will accumulate in the system will scarcely be enough to notice, even after several years. If, on the other hand, the system must be replenished daily, the amount of foreign matter which will accumulate will soon result in trouble, and, contrary to some of the preachings, the type of radiator employed will have little or no influence on the result.

Since a little sediment will accumulate over the surfaces of the system in the course of time no matter how commodious the radiator is, it stands to reason that it should be liberally proportioned for the work it will have to do, in order that it will be large enough to properly serve the purpose when the surfaces become slightly coated.

The effect of incrustation is most marked; if the scale is 1-16 inch thick it will diminish the efficiency to 7-8 of that which will obtain when the surfaces are perfectly clean. From this point on, if the crust thickens, the diminished efficiency will be proportional to the square of the thickness of the scale.

It has been repeatedly stated by the most competent authorities that scale, once it is deposited, cannot be removed excepting by scraping. Whether it can or not will not alter the fact that radiators, as they are made, cannot be mechanically gone over with a scraper. If, in the attempt to remove scale by means of chemicals, the surfaces are attacked, the damage, as measured in dollars, will be equal to the cost of a new radiator sooner or later.

Under the circumstances, if a radiator is not large enough to do the work without evaporating water, it is a moral certainty that the time will arrive when the motor will fail to do its best work, even if it does not indicate trouble of a more serious nature. If the radiator is large enough to accomplish the cooling purpose without boiling the water, the question of eliminating the foreign matter will not have to be coped with, but if the reverse is true, the one safe measure lies in removing the foreign matter before the water is placed in the radiator.

The temperature of precipitation, as shown in the table of precipitations, will obtain under conditions of a heated radiator to a degree high enough to induce serious trouble, and, the vegetable matter, which is a crust former of no mean ability, will precipitate in the presence of iron at any temperature.

One very good way to filter water is to allow it to settle in a barrel in which a quantity of pig iron is placed; the foreign matter will adhere to the pig iron, and, from time to time the same may be removed and washed. This process will not eliminate the salts of sodium, calcium and magnesium—they must be treated under proper conditions of temperature in the presence of substances given in the table of elimination of impurities.

Distilled water is the one right answer; it will be so free from all scaling substances that no further trouble needs be anticipated, and the cost of the same is far less than the repair account which will fall to the lot of the owner who is keeping company with a car which is fitted out with a steaming radiator.

Temperature of Calcareous Precipitations

(A) Carbonate of lime; minimum temperature 176 degrees F.
(B) Sulphate of lime; minimum temperature 284 degrees F.
(C) Chloride of magnesium; minimum temperature 212 degrees F.
(D) Chloride of sodium; minimum 324 degrees F.
(E) Carbonate of lime is held in solution of bicarbonic acid.
(F) Heating drives off the carbonic acid and the salts will then precipitate.
(G) Sulphate of lime is most soluble in water at 95 degrees F.

Note.—If a radiator is large enough to properly cool a motor, it is highly improbable that the temperature will increase sufficiently to deposit any but carbonate of lime.

ELECTROLYTIC ACTION IS MUCH TO BE FEARED

Any metallic salts, or acidity, in the presence of any two or more metals submerged in water will constitute an electric couple, and local action will follow. The metals, differing from each other, will form the poles of a battery and the water, charged with salts or acid, will compose the electrolyte. It will be impossible to state with any degree of certainty as to the extent of the electrolytic action which will be set up in a radiator when acid or salts is present, due to lack of data of the degrees of concentration of the electrolyte, and the nature of the chemicals.

Electrolytic metallurgy, which is the heading under which all such matters are dealt with, consists of the very process by which metals are dissolved, deposited, and separated under the electrolytic action which is sure to follow if two or more differing metals are submerged in an electrolyte.

It is for this reason that calcium chloride, if it is employed in solution to prevent freezing, is so very dangerous; this danger is particularly noticeable when the chloride is of the brand designated as "commercial"; this form of the material is sufficiently impure to hasten the electrolytic action. Heat, as it is bound to be a condition in radiator work, hastens the electrolytic action; the extent of this action being intensified as the temperature increases up to a certain point.

Sodium chloride (common salt) would be an excellent material to add to water for the purpose of preventing freezing were it not for the electrolytic action which would surely follow its use. Grease, on the other hand, is not good for the purpose. The grease will coat over all the surfaces of the radiating system and retard the transfer of heat just as a crust of foreign substance will. The grease coat, if it forms, will pick up foreign matter and form a hard crust which is a very perfect insulator of heat, which is exactly what is not wanted in a cooling system.

Mineral oil, after it has been filtered a number of times by passing it through fuller's earth, if it is very lacking in viscosity, will do cooling work, but, unfortunately, it is necessary to design the radiator in view of the use of this cooling medium. A considerably greater area of cooling surface is required than when water is used.

Alcohol in water will do very well for a freezing mixture, especially if the alcohol is pure, and the water is distilled. About one-quarter of the whole solution should be alcohol. Care must be exercised to maintain the strength of the solution; the alcohol will evaporate more rapidly than the water; it is not a very good solution to use in a steaming system. As a matter of fact there seems to be no good way of keeping entirely out of trouble if the radiator is not large enough for the work which will have to be done, and, when all is said, it is probably cheaper to purchase a new and better radiator in a case of this sort.

Glycerine, in the proportion of 1:4, the major portion being water, is much used and it seems to be very good excepting that it becomes foul after a time and a new supply must then be used; it is rather high priced, and it attacks the hose connections which are placed in the piping system to form flexible joints.

In winter (cold) weather, if autoists do not care to risk the use of cooling solutions with which they have no experience, it is necessary for them to empty the water system out every time the automobile is stopped if the time of interruption is more than that which will allow of the water being cooled off. The very fact that a radiator is efficient is the reason why it will ice up in a little while.

CARBON FORMATIONS IN CYLINDERS MAKE TROUBLE

It is not in the cooling system alone that trouble is to be expected from incrustation. If a coating forms over the combustion surfaces, it will have just the same effect as if it grows on the surfaces of the radiator. This crust, while it is attributed to free carbon in the lubricating oil, may come out of the gasoline, due to the use of an excess. It may also be due to silicon and other foreign matter, which will be sucked in through the air intakes of the carbureter. The inner surfaces of the combustion chamber, unless they are kept free from incrustation, will materially reduce the good performance of a motor, nor is the usual theory in relation to this action in full accord with the facts.

Knocking will follow if the pressure wave increases at a very rapid rate to a very high point, and this condition will be induced if a coat of carbon or other heat retarding substances is formed over the internal surfaces of the cylinders. The amount of the formation will not have to be so great as to increase the compression as is so generally believed, but just enough to prevent the heat to pass to the water jacket, at the time when the excess will induce a sudden increase in the pressure wave.

Carbon will coke out of the gasoline if the same is in excess and the heat is applied at such a rapid rate, at the high temperature required, to break down the gasoline structure; all the carbon in the fuel, under these conditions, which does not pick up oxygen, will coke out. The excess gasoline will not find oxygen sufficient to produce carbonic acid, carbonic oxide, or water, and, all that can be formed, under such conditions, will be coke.

This trouble is mostly charged up to lubricating oil, but it is now fairly well established that much of it is caused by the presence of an excess of gasoline, or, what amounts to the same thing from this point of view, lack of air. It is to be seen, considering this idea, that the questions of the carbureter are included in a sense, and in coping with the problems of the cooling system it is necessary to be sure that the fuel relation is within manageable bounds. For that matter, ignition troubles must be eliminated when the radiator question is being investigated.

There is nothing in this article which should be very consoling to the autoist who has picked the wrong cooling system, nor is there any statement to the effect that a motor will not run if the radiator is not big enough for the purpose, but there are strong grounds for suspecting that it is economy in the long run to purchase a sufficiently large radiator to do the work without steaming. It is even a question if there is much danger of being able to use a radiator which will be too large for the purpose—room is much restricted in automobiles. Here, as in most cases, it is better to err on the right side.

Causes of Incrustation in Radiators

Deposition of:
(A) Lime soap.
(B) Iron soap.
(C) Grease saponification with other substances.
(D) Sulphate of lime.
(E) Carbonate of magnesium.
(F) Carbonate of magnesia.
(G) Other magnesium salts.
(H) Suspended vegetable matter.

Note.—If the radiator is not of a good design, it is likely that all these troubles will be experienced the sooner; fins, projections, and places of lodgement are bound to attract precipitations, and, if the location of the accumulations is that which will stop circulation, trouble must follow.

Preventives of Incrustation in Radiators

(A) The use of distilled water.
(B) By filtering and boiling the water.
(C) By maintaining a low temperature of the water.
(D) Removal of carbonic acid from water and settling.
(E) By chemical treatment of the water.
(F) By removing the water from the radiator frequently.
(G) By blowing out the radiator with steam.
(H) By the use of some chemical medium besides water.

Note.—In some geographical localities the troubles which are due to precipitations and the resultant incrustation, are very noticeable as compared with others, and it is for this reason that complaints from some autoists are not verified by others.

Electrolytic Action Used in the Arts

(A) In electrotyping.
(B) Electroplating.
(C) Electrolytic reduction of metals.
(D) Electrolytic refining of metals.
(E) As a destructive process in steam boilers.
(F) As a destructive process in automobile radiators.

Note.—If a process is so pronounced that it may be used in the arts to advantage, this is proof of the fact that the same process, if it is used under damaging conditions, will be rapid, and, success, if it is to attend the plan demands that this action be eliminated entirely.

The way to avoid such action is to maintain a pure state of the cooling medium—chemically pure if possible.

GOOD ROADS, CUSHION TIRES

Editor THE AUTOMOBILE:

[2,175]—I wish to ask your advice as to tire trouble. I have a Pope-Tribune, one seat single-cylinder car, with wheels 28 by 2 1-2. Now, I live five miles from town on a good smooth pike, and when my wife and I ride in it, we go for pleasure and not for a speed record. I do not care to go more than 10 miles per hour, but I want to go with a certainty of no tire trouble, as I am too old for that kind of trouble or monkeying. Could I put on a good solid tire or cushion tire and get good results with it at a moderate speed, and at about the same expense as I am now having with pneumatics, or would it shake up my engine too much? It is a vertical engine, well braced and fastened to the frame. Last year my car was the second in the county, now there are no less than thirteen.

Cynthiana, Ky. J. P. HODSON.

At the very modest speed, to which this gentleman is partial, solid tires would do very well, the slow speed reducing the bouncing and bumping to a minimum quantity, if not to a negligible amount. As was pointed out in last week's paper, the influence of speed upon the stresses and strains of the car is just twice that due to weight. At this very low speed, ten miles, the factor, V^2, becomes very small. The change to solids would be a safe one under these circumstances.

TIMING OF THE INLET VALVE

Editor THE AUTOMOBILE:

[2,176]—Will you please answer the following in your "Letters Answered and Discussed": At what time should the intake of a two-cylinder engine open after the piston leaves dead center? That is, we want to know at what time it should begin to open.

Roachdale, Ind. LOCKRIDGE & ASHBY.

If the exhaust valves of your engine are working properly, you can time the inlet valves from them; the inlets should open just as soon as the exhausts are firmly closed. In any case, the timing of the inlets must depend on that of the exhausts, as they must not open before the exhausts have closed. If you are sure of the exhaust, then, you will need no further information. The timing for a two-cylinder motor is no different from that of any other motor, except in the fine points raised by the different speed conditions under which the engines are run.

Customary practice in regard to opening the inlet valve varies between 10 and 20 degrees travel of the crank after the dead center, depending, as stated above, on the closing of the exhaust valve. Practice also varies as to whether the inlet valve should open immediately after the closing of the exhaust, or whether there should be more or less of an interval between.

If your exhaust timing is wrong, too, the best thing for you to do is to write to the makers and find out how it was intended to be. Most modern motors have the timing marked on the flywheel. The inlet valve should hold open about as much after the lower as it delays opening after the upper center.

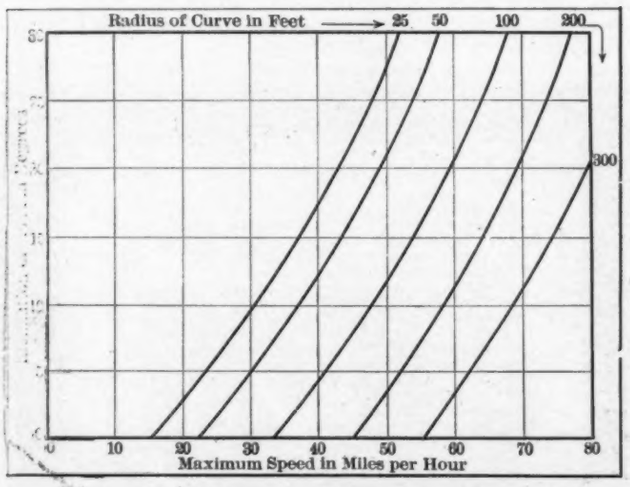


Chart of Relation of Speed to Curvature

LETTERS INTERESTING

HEATING GARAGES BY STOVES

Editor THE AUTOMOBILE:

[2,177]—Referring to the inquiry number 2,139, appearing in the January twentieth issue of "The Automobile," in which you speak of some simple heating contrivance to be used in heating a barn, do you think such a stove safe for a private garage owner of a small barn? Can such a one be used with perfect safety and no fear of explosion? I keep my tank in the car filled with gasoline, and often in the mornings, when opening the garage doors, I detect a perceptible odor of gasoline, making me fearful of installing a stove.

New York City. E. N. W.

If you keep gasoline other than that in the tank of your car in the garage it certainly would be dangerous to keep a stove there for heating purposes. If not, however, the tank in the car should not entail any danger, and if, as is stated above, a perceptible smell of fuel is noticed every morning, without any fuel being spilled, it must be that there is a leak in the present tank. Look to this point very carefully, as it not only means a high consumption, and consequently expensive fuel bill, but some fine day your car, garage and other belongings will suddenly start in to emulate the Wright brothers and other human birds. This sort of thing makes people peevish, so it is well to provide against it.

BANKING, CURVES AND SPEEDS

Editor THE AUTOMOBILE:

[2,178]—I have been somewhat confused with the various references to the relation of the curvature and banking of racing tracks to the possible speeds. Will you please explain this in some detail, through your column of "Letters" and help out a number of interested subscribers?

New Rochelle, N. Y. INTERESTED SUBSCRIBER.

To give the exact relation of these three quantities would entail much mathematics, but the crux of the situation is given in the appended curve, which shows this interrelation. The vertical quantities or ordinates are the inclination of the road or track to a horizontal in degrees. At the top the abcissæ are the feet radius of the curve, while at the bottom the abcissæ are speeds in miles per hour. It is here seen that the three quantities are so closely related that it is impossible to change any one without altering the others. Thus, to obtain a speed of 50 miles per hour on a curve of 100 feet radius, follow the curve from 100 radius down to the intersection with the vertical line representing the speed desired (50 miles). Thence proceed across the horizontal line to the left-hand scale to find the banking necessary to allow this speed without overturning, in this case 13 degrees. Similarly, knowing the banking and radius, the possible speed may be found as follows: Suppose there is a radius of 200 feet and that the banking is 15 degrees. Then, proceed from the 15-degree line at the left across to the intersection with the curve for 200 feet radius, drop down vertically to the base line from this intersection and find the desired speed, 64 miles per hour. Similarly given any two quantities the third can be found using this curve, or given but one, an assumption may be made for a second, and the third thus found, approximately. This may be repeated, using higher and lower value for the assumption, until the desired combination is found.

The banking of automobile tracks, so-called "motordromes," is rarely sufficient. A few extra inches of dirt on the outside allows the promoters to claim that it is "scientifically banked."

ANSWERED AND DISCUSSED

STUDENTS' SIDE OF EMPLOYMENT

Editor THE AUTOMOBILE:

[2,179]—I note in one of the back numbers of "The Automobile" of which I am now a constant reader, on page 1067 of Dec. 16, 1909, Robert Jardine, superintendent of the Royal Tourist Car Company's plant at Cleveland, states that the greatest need of the automobile industry is a supply of intelligent machinists, and also says that all around men are badly needed. Again he says: "The trouble seems to be that young men who have passed through high school will not enter a plant as apprentices." He may be right when he says they will not enter, but there's a reason. It is not because they are not interested, for where I attended high school last year in Connecticut, there were some who were studying automobiles nights. I was one of the interested ones. One of our number obtained a position in a New England factory, and the agreement was this: He must work six weeks for absolutely nothing, after which he would receive a dollar a day. Take a lad living away from home, how can he do it? It appears that the manufacturers want the lads and the lads want the positions (and I am one of those lads) but the trouble is that these lads cannot afford to start. If any real opportunity arrives I would like to obtain one of these positions myself, and would gladly receive any direct communications from the manufacturers. I have spoken in behalf of the high school student and its graduates.

Greenfield, Mass. CLINTON J. CONVERSE.

MAGNETO AND OTHER DIAGRAMS

Editor THE AUTOMOBILE:

[2,180]—Will you please explain through the excellent and very enjoyable "Letters Interesting, Answered and Discussed" what is the difference between the various electrical windings, that is, how does the magneto winding differ from dynamo winding. Also, what is the difference between shunt, series, compound, and other windings, often spoken of? Please illustrate by diagrams.

Buffalo, N. Y. R. E. P.

Magneto winding differs from other winding in that the former is wound to produce a spark at a given time when the circuit is ruptured, which is done frequently. The latter, on the other hand, considering dynamos, motors and the like, are wound so as never to produce sparks, and the current output is a steady discharge or continuous input, with no interruptions.

In the sketch below this is depicted graphically, the magneto winding being shown first; separately excited field, second; series winding, third, and in the lower row, in order, shunt, compound, and differential windings. Each one of these has a different use requiring the difference in the winding.

In the first, separately excited, it is seen that the current which passes through the field is supplied from an outside source, the two wires leading off at the side indicating this. In the second, series winding, it is seen that one of the leads from the rotating armature is wound around and through the field, while the other armature lead is direct. Shunt winding consists of a winding from one of the armature leads, around through the field, then back onto the other armature lead; that is, it forms a loop around the armature windings. Compound winding is, as will be seen in the figure, a combination of the shunt and series windings, its name indicating that it is a compounding of some other methods. Lastly, differential winding is shown. In this an armature lead is utilized for the lower layer of the field, being wound upon itself for the second layer of the field. It forms a shunt upon the armature circuit, this having been previously described as nothing more than a loop. Magnetos, properly speaking, have no field winding at all.

CHANCES FOR YOUNG DRIVERS

Editor THE AUTOMOBILE:

[2,181]—Would you kindly answer the following questions: (1) Are there any automobile companies looking for men to drive cars? (2) Could a young man having one season's experience driving and taking care of a car, and having no bad habits, easily obtain a position as a chauffeur? Are these young men much in demand? (3) In what States do chauffeurs require a separate license?

Anita, Ia. A SUBSCRIBER.

All of the automobile companies are now looking for men of experience, particularly in Detroit, where there is said to be a famine of men. The Chamber of Commerce of that city is said to have imported some 16,000 men in the past year from other cities, but still there is not enough to go around.

Yes, a young man such as is described could easily obtain a position as a chauffeur, and, as we understand it, such drivers are in demand at all times.

Nearly every State in the Union requires a license, but in a great many of the States the license is taken out for the car, no matter who drives. In such States, of which we are now unable to give you a list, the chauffeur would not need a license.

METHODS OF STARTING THE CAR

Editor THE AUTOMOBILE:

[2,182]—In your issue of January 20, 1910, E. J. Montgomery, of Clinton, Mo., complains of difficulty in starting his motor in zero weather.

Your solution of the difficulty was to install a heating plant which is no doubt the very best advice under the circumstances.

My car is housed in a cold stable, and although generally speaking, our winter has been very mild so far, we have had to turn on the "juice."

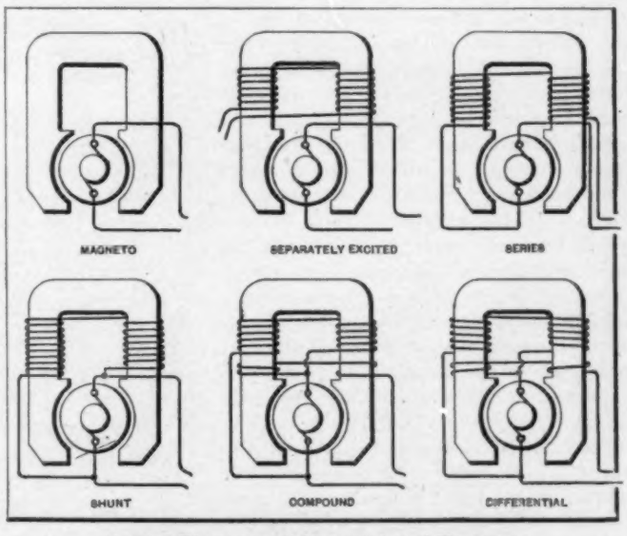
While I am eating breakfast the lamp warms up enough to make cranking comparatively easy, so that by using a little ether on a piece of cloth stuffed in the air intake of the carburetor "she is off" after being turned over a couple of times.

The idea of using ether to help start was given in the columns of your paper some time ago, and I have found it very helpful a few mornings when the temperature was from 6 to 10 degrees below.

Now when I get up in the morning and find it so very cold I go out in the garage and take a thirty-two candlepower electric lamp attached to a flexible cord, and lifting the hood put the lamp inside next to the carburetor and crankcase. Then I put the hood down and cover the radiator and hood all over with my large fur robe, and I hope the above suggestions may prove helpful to your correspondent and possibly others.

Concord, N. H. CHARLES H. COOK, JR.

This is a very good method, but we should think it very expensive. Not only is electricity expensive, but the very large lamp used consumes much current. The whole should put the electric light method of warming garages out of the question for the little fellow, who must perforce economize on garage charges.



Wiring Diagrams of Magnetos and Dynamos

Clutch Repairs and Maintenance

By Oliver Light

CLUTCHES are of many forms, in fact, one might say that there are as many clutches as there are automobiles. The various constructions may be divided into groups, each one varying from the others only in the matter of minor detail, according to the individual preferences of the designer responsible for the car to which it is applied. The forms to be considered as typical of standard practice are the cone, three-plate, expanding band, and multiple disc clutching devices.

Troubles evidenced in one form may be found in others, though as a rule the same conditions cannot apply to those of different types. The cone and expanding-band forms will require about the same degree of care and attention, and will be subject to the same derangements, while the multiple-disc construction will deteriorate in an entirely different manner.

Perhaps the most common form is the cone, which consists of male and female members and a spring to maintain contact between them. The female portion is often formed directly in the flywheel rim, while the other member is a casting or stamping faced with some friction material. Next in order of importance are the multiple-disc clutches, designed with a view of eliminating some of the troubles present with other forms, but which at the same time introduce others in their application and operation. The expanding band and three-plate share the honors as to popularity, but as they are fitted to cars of reputable make, demand some consideration, though one rarely sees a clutch of the external constricting-band type.

Speaking as a repairman who has had experience with each and every form, and is able to expose their various weaknesses, at the same time suggesting differences in construction which might be of use to any skilful designer, willing to use them, but who also can see disadvantages which are not so evident to their creators, the writer will analyze some of the successful forms and expose their weaknesses, at the same time suggesting methods of repairing them which have proven practical.

Failure to Engage Properly, the Biggest Trouble—The troubles which most often develop are failure to engage properly, which may be either slipping or failure to transmit power, or harsh and too rapid engagement, or imperfect release. Those clutches faced with frictional material will deteriorate because of loss of this facing through natural wear, while other forms will prove unsatisfactory in operation due to other conditions. In overhauling a car, even if the clutch mechanism has not given trouble it will be well to take it apart and carefully examine the components to detect wear that may cause trouble in time, and which can best be prevented by proper restoration.

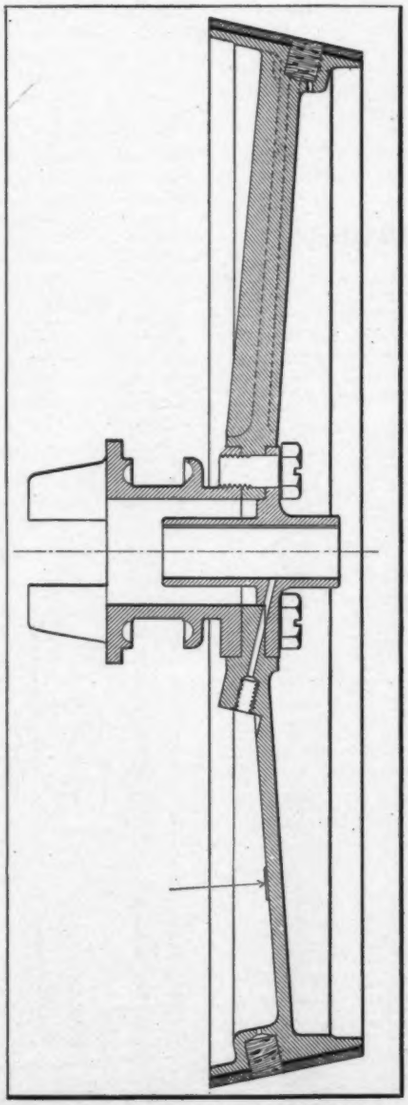


Fig. 1—Illustrating a leather-faced cone clutch with cork inserts

Deterioration, Considering Cone Clutches—If a clutch of the cone type has been properly designed the only points where deterioration will be manifest will be at the leather facing and at the bearing surfaces of the male member where it revolves on the shaft. The leather may have become hard or charred because of slipping that has caused the facing to heat. The spring that holds the parts into engagement may be broken or weakened and this will be sufficient to cause trouble even if the facing is in perfect condition.

Any wear at the bearings will cause the cone to sag when the spring pressure is released and will cause dragging as the parts are still in partial contact. If the leather wears so that the rivets holding it to the cone bear against the frictional surface of the other member, the clutch will slip and the surface may become cut or roughened by the abrading action of unlubricated metals in contact. Two of the most common clutch troubles are harsh engagement as one extreme and slipping as the other, and if the facing appears to be in the proper condition, that is, not charred or worn too much, it will be a comparatively easy matter to make a remedy. Slipping is caused by the frictional material becoming coated with lubricant, reducing the coefficient of friction to a low point.

Under these circumstances, the pressure of the spring may not be sufficient to maintain the parts in proper contact. This surplus of oil may be observed by various substances, the most efficient being fuller's earth, well rubbed into the surface. If the clutch cone is in place this material may be inserted with a small bellows such as used for injecting insect powder in inaccessible places.

It is sometimes possible to place enough of this material on a card or piece of paper to apply it to the surface through the space left between the cone and the outer member when the former has been fully disengaged. Borax has been used with good results but never use rosin, which is often advised by the armchair expert, for while it may work very satisfactory for a time, should the clutch slip it will melt, and rosin in liquid form acts as a lubricant, and the effect is worse than before it was applied, acting the same as though the leather had been oiled.

Causes of Harsh Engagement—If a clutch of the leather-faced type is engaging too harshly it is due generally to the leather becoming hard and dry, and not yielding when brought into frictional contact with the co-acting metal surface. To secure gradual acceleration the clutch leather should be soft, that is, it should

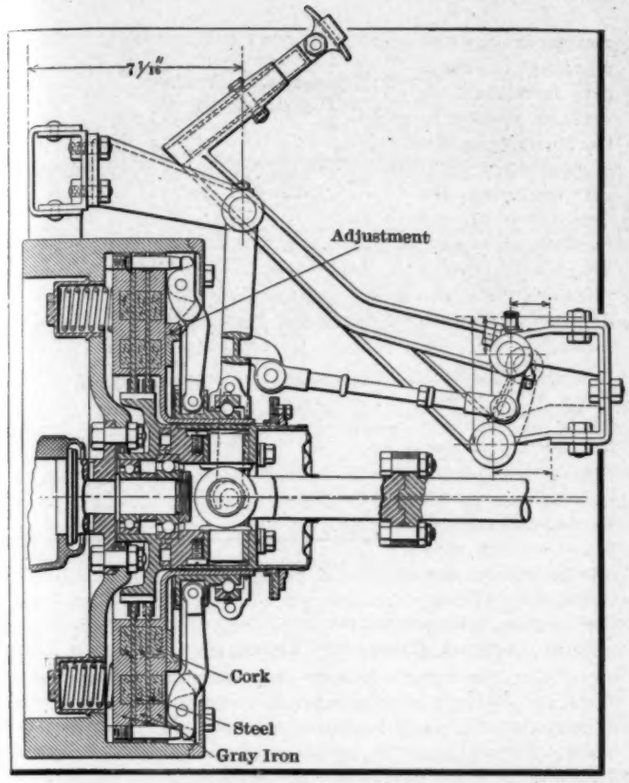


Fig. 2—A five-plate clutch of steel and iron, with cork inserts in the iron plates

have sufficient elasticity to yield slightly before becoming fully engaged. If the leather facing is not charred or worn unduly, being merely hard, it may be restored by rubbing a small amount of either neatsfoot or castor oil into it, which will soften it and make it more elastic if hard because of the natural oils drying out.

Kerosene oil may be used in a pinch, and the writer has often had occasion to use this material on the road when the others were not available, taking this from the lamps. Never allow a clutch to slip, as a slightly harsh member is to be preferred to one that will not drive properly. If slipping is evidenced and allowed to continue, the frictional facing of the male member, especially if of leather, will harden or the surface become glazed over, or so heated that charring and resulting destruction will follow and involve more or less costly repairs.

In the event of the surface becoming glazed, it can be roughened up with a piece of coarse sandpaper or a rasp. Among the good features of kerosene may be mentioned that it acts satisfactorily as a clutch-leather dressing, as it has very little lubricating qualities and while it will keep the leather pliable it will not increase the coefficient of friction existing between the surfaces as will either of the lubricants or heavier oils mentioned previously.

This liquid has the additional advantage of penetrating the surface quicker than the heavier oils, and is not so liable to gum or hold other oil. Many authorities advise the motorist to clean out the clutch leather with gasoline in event of slipping, but this practice cannot be too strongly deprecated. This treatment will harden the leather, and will induce the opposite condition to slipping, which is equally undesirable. If the slipping is due to lubricant, absorb it with fuller's earth.

How to Cure Slipping Due to Weak Springs—Slipping, due to weakening of the springs, may be remedied by the substitution of members of greater strength or by increasing the degree of tension of the weak spring if some method of compensation or adjustment is provided. Where the leather or other frictional facing is worn too much, the member may engage so deeply as to bottom against the flywheel, in which event slipping is inevitable. The only remedy is fitting a new leather, and while mechanical skill is required to properly fit a new facing, it is not difficult or beyond the ability of the average individual.

If the old leather is not broken or torn it may be removed intact and used as a pattern to cut the new one by, though when it is necessary to reline the cone, the old leather is often removed in fragments. Should this be the case the correct shape for the new facing may be determined by cutting a pattern from stiff wrapping paper, or a simple process of laying out will save much time and stock in cutting the material to the proper size before fitting.

An old dodge often used by the experienced repairman is to take a large sheet of paper and lay out the clutch-cone section to exact size, being sure that the faces are at proper angle and a proper distance from the center line. Draw a long line through the center of the hub and continue the angle of the cone by straight lines meeting on this center line.

Use the point thus obtained as a center and the distances from the outer edge of the cone to this point as one radius and from the inner edge of the cone to the point as the other radius, then describe two arcs which will be of concentric circles and will be as far apart as the width of the cone along the angular face. The circumference of the cone at both the outer and inner edges is then obtained, and one-half thus ruled off on the arcs described at either side of the central line drawn through the clutch hub.

The amount ruled off the larger arc must equal a little more than the larger circumference of the cone, while that ruled on the inner arc must equal a little more than the smaller circumference. This is advisable because it is well to make the strip a little longer and allow for fitting. The pattern thus obtained my be used to cut the new leather.

Opinions Differ as to Oiling Leather—Before riveting in place the leather should be made as pliable as possible with oil, though there exists some difference of opinion among repairmen regarding this practice. Some advocate soaking the leather in water and applying it wet, that when it dries it will shrink closer to the cone, while others apply it dry and oil it after it is in

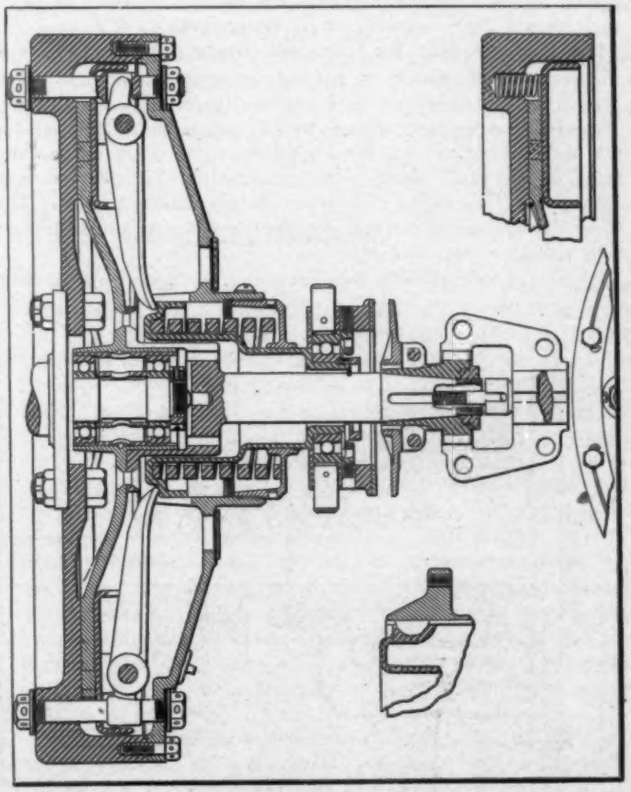


Fig. 3—High power three-disc clutch of unusual diameter and very simple

place. The writer does not favor wetting the leather, as after it is in place and shrinks it often pulls away from the rivets and when applied dry and oiled after the cone has been surfaced it will be liable to bunch between the rivets.

When the leather is oiled before application with either neatsfoot, castor oil or even kerosene, it is soft, pliable and elastic and if properly fitted there will be no trouble in the leather either becoming too loose or so closely engaged around the cone that it may burst from its fastenings.

The actual process of fitting will vary with the ideas of the mechanic doing the work, though as good a method as any consists of placing the leather in position at one end, holding it in position by small clamps. The holes may be then drilled and the leather riveted in place, care being taken that the rivet holes have a countersink deep enough so that the head of the rivet will come well below the surface of the leather.

After one end is firmly secured, the leather is pulled around the cone to the next point of fastening, the facing being kept in a taut condition by a clamp while the holes are being drilled for the second set of rivets. This operation is repeated from one point to the other all around the circumference of the cone. Fitting the facing in this manner insures that it will hug the cone closely instead of bunching up between the rivets as is the case when all the holes are drilled into the leather at the same time.

When the facing is applied the cone should be swung in a lathe and the surface of the leather trued by taking a light cut of its surface with a cutting tool, or the high spots may be rubbed off by hand with coarse sandpaper, glass or a coarse file. The best material for cone facing is good oaktanned leather, such as used for belting, though hemlocktanned has often been used. The writer has found that the former material possesses most of the qualities of elasticity, durability, and frictional adhesion required.

Sometimes a clutch will engage harshly and if the leather face seems to be in good condition, it may be well to see if the small spring members, often placed under the leather facing, are in proper condition and that the surface is raised at spots, as it should be to secure gradual engagement.

Old Clutches May Be Improved, Using Surface Springs— Many cars of old pattern do not have these springs and the clutch action may be improved by fitting appliances of this character. The small flat springs inserted directly under the leather surface are not satisfactory in general application, the preferred method being to use small plungers or member that will depress flush with the surface of the cone when the pressure is applied. The small flat springs under the surface are liable to break or lose their elasticity after continued use.

There has been considerable interest in the application of cork inserts in clutch members to eliminate harshness, as well as increasing the power transmission qualities without increasing the dimensions of the friction surface. They are of obvious value and the writer does not hesitate to commend their use wherever practical. There are instances where this material has worn, however, and the good qualities lost. In such an event replacement is the only remedy and as new corks are inexpensive, there is not much excuse for failure to apply them at once.

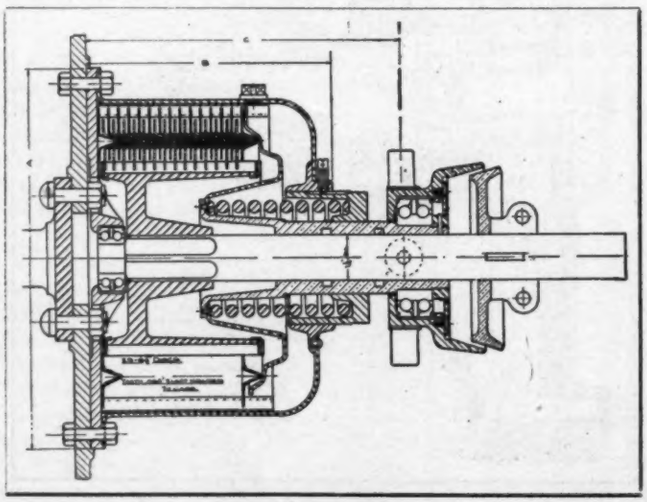


Fig. 4—Multiple disc clutch of the Hele-Shaw type, readily accessible

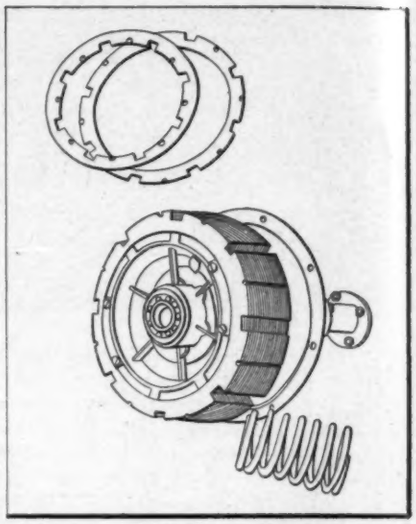


Fig. 5—Another multiple disc clutch but of the flat plate type

Some Common Causes of "Spinning"— The writer knows of no more annoying condition than continued rotation of the clutch parts when the spring tension is released, this being known as spinning. This may be due to natural causes, such as inertia due to the use of clutch members of considerable weight and diameter, but it is often caused by derangement of the parts.

If the bearing in which the transmission shaft telescopes runs dry, or that on which the cone revolves when disengaged is not properly oiled or seizes, the male member will continue to spin, even when disengaged. When the clutch is dismembered it will be well to examine the shaft for any roughness, see that the oil holes are clean and allow the lubricant to reach the bearing parts.

A sudden road strain often produces enough distortion of the frame to cause a slight disalignment between the members of the clutch, especially if joined to the gear box by a mere telescopic or sliding joint which does not permit of universal action. Again, if the bearing or bushing in the cone hub is worn unduly the member may sag and remain in contact with the female portion. A ball-thrust bearing may become tightly bound because of a broken ball or particles of foreign matter which will cause the motion of the engine to be transmitted to the male member by the clutch spring. If the trouble is produced by natural causes it is not difficult to fit small brakes which will be interacting with the clutch pedal and act as a retarding medium to resist continued rotation due to inertia.

For relining the cone the suggestions given will apply as well to any other form of clutch which uses leather as a frictional material. An example of clutches of this class are the internal-band clutch, which has been fitted to a number of prominent cars in the past. In most cases, the leather facing wears more rapidly than on the cone and is more susceptible to the effects of lubricant on the surface.

A feature of these is that means are provided for compensating for wear of the frictional material, though adjustments must be made with care or they will drag. In event of slipping because of surplus oil, the same attention should be given as in the cone. As is true of the form previously discussed, harsh engagement is due to the leather surface being hard, and slipping will cause heating and deterioration of the drum facing.

If necessary to reline the steel band, it is removed from the aluminum cylinder and the leather applied in the conventional manner, and as the surface is parallel with the shaft there should be no difficulty in fitting a new strip when needed. After this is riveted to the band the latter is replaced on the drum and the leverage coupled so that the steel band will hug the outer periphery, and the entire assembly is then placed in a lathe on

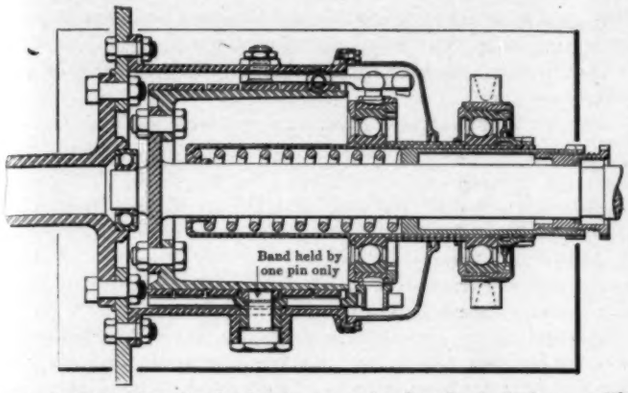


Fig. 6—Wrapping band clutch on a hardened steel drum with means for take-up

centers and the outer surface of the leather is trued and smoothed. Special care should be taken in applying the rivets, as in the form previously considered. The leather should be pliable and soft.

Multiple Disc Much Used Nowadays—Many modern cars are fitted with multiple-disc clutches, the plates in some cases being entirely of saw-blade steel; in others of a combination of different metals, such as steel to bronze, etc. It is well to take a construction of this kind apart and carefully examine the condition of the plates. These should be perfectly smooth and clean and the co-acting surfaces free from roughness, cuts or scratches. A most common cause of slipping with this form is caused by distortion of the thin plates because of becoming heated by continual slipping, which may be caused by abuse of the driver or to weakness of the spring maintaining contact between the parts.

Too harsh engagement is caused by lack of lubricant, excessive spring pressure, presence of carbon or roughness of the surfaces. Spinning is promoted by seizing between the plates due to either the burnt or gummed lubricant between them, the weakening of the small springs designed to hold the plates apart when the spring pressure is released, or the attraction or adhesion of the plates to each other because of too thick oil between them.

In many cases, distortion of the plates is caused by internal stresses in the material because of the rolling, which can only be removed by annealing the discs and straightening them on a surface plate. If on examination it is found that the interior of the clutch is blackened, there is not oil present and the plates have seized because of lack of lubricant, the clutch should be disassembled, the plates separated and the scored or cut surfaces smoothed with a surface grinder or by hand, using fine emery cloth.

More Care in Selecting Oil for Multiple Disc—It is imperative that only a good grade of medium or light cylinder oil be used in any multiple-disc clutch, as the inferior oils or those of too great viscosity will gum and carbonize because of the heat, and in either case they are valueless. If a multiple flat-plate clutch drags, one may suspect the use of unsuitable oil. In types where the pressure is maintained by a spring acting against a ball-thrust bearing it is imperative that this component be maintained in condition and well oiled at all times. In many cases, faulty clutch action has been due to conditions existing outside of the clutch, such as wear at the various points of the operating mechanism and defective adjustment of the linkage.

As the type of control differs with every car it is not possible to suggest other than general instructions. Many cases of failure of clutch to release have been traced to poor adjustment of the interlocking levers and rods, for instance, a worn shifting collar or yoke often hinders disengagement, as the clutch pedal may be fully depressed without materially releasing the spring pressure maintaining the members in contact.

Small pins are often worn to half their diameter and the holes in which they are designed to fit are worn oval, considerable play being evident. If this exists at several points it may amount to considerable and the lost motion not only produces rattle, but makes proper operation of the clutching mechanism impossible.

Failure of clutches to engage properly has been caused by faulty adjustment of the interlocking leverage, where the emergency brake lever acts upon the clutch, disengaging it when it is applied. Often an incompetent person will compensate for wear by shortening or lengthening the brake-operating rods, and this may have the effect of throwing out the clutch mechanism slightly, and an unexplainable slipping will be caused because the interlocking connection holds the clutch partly out and does not permit of the full spring pressure being exerted.

This is a small but important point, which amateur drivers should bear in mind when having clutch trouble, which seems to need an explanation, or in cases of inexplainable trouble which cannot be traced to any other source. Remember this point.

Notes on Alloy Steels Used in Automobiles

WONDERFUL stimulus has been given the metallurgy of special steels by the demands of automobile construction and constructors. The extent of this demand, and the ready response of the steel makers, together with some notes of the resulting product, were all given space in an English article on this subject which appeared some months ago. This is given herewith, or, rather, extracts from it are given, in the hope of being useful to some members of the automobile profession on this side.

The heavy moral responsibility which rests upon both the maker and user of alloy steels and the tremendous duty expected of these materials of construction—lightness without sacrifice of toughness or strength—tend to make the requirements of the motor trade most exacting. It is inconceivable to the mind how any firm can conscientiously put out a car and not know intimately the materials used in every essential part. Yet such is frequently the case. For example, nickel steel is asked for. Now, nickel steel is a delightfully variable and uncertain quantity as ordinarily made. There are of nickel steels at least fifty-seven varieties, and the user should know what kind of nickel steel goes into his gears and who makes the steel, as well as the gears.

Dr. Guillet, the distinguished French metallurgist, has pointed out that the constitution and mechanical properties of nickel steel depend essentially upon the sum of the carbon and nickel. From past experiences should be added to this sum the manganese. One hears continually in the trade nickel steel referred to solely by its percentage of nickel. Such expressions possess no real significance as a measure of quality or adaptability for various purposes. It is the skilful blending of the elements—carbon, nickel and manganese—that counts. The successful accomplishment of this is a fine art.

Almost as bad as not specifying at all is the tendency upon the part of many buyers to tell the maker how he ought to make his steel; to specify chemical analyses and physical tests which are a misfit, and to make the wording of the specification a place to show how much they know, as well as to display a mental attitude of favor or antagonism to any of the parties affected by it.

Without attempting any scientific classification of alloy steel, or enumerating all types that have been used at home and abroad, the principal types will be described as briefly as possible, utilizing only those which have been used freely in the automobile business in the last two or three years.

ANALYSIS OF NICKEL STEEL

Nickel steel is perhaps the most generally used of the alloy steels. The analysis usually desired, but not always attained, is: Carbon, 0.20 to 0.25; nickel, 3.50; manganese, 0.60 to 0.90; sulphur and phosphorous, not over 0.04. With the proportions of carbon and nickel stated, manganese ought never to exceed the limits mentioned. A slightly lower carbon is sometimes used for case-hardened purposes, and a higher carbon is much used for crankshafts. With higher carbon I should prefer lower manganese. A small quantity of 5 per cent nickel steel is used in about the same carbons. With reasonable care, nickel steel can be made uniform, physically sound, and free cutting.

It has remarkably good mechanical qualities when subjected to suitable heat treatment, and is an excellent steel for case-hardening.

In machining qualities it is usually accorded first place among the alloy steels. When extraordinary care is used in its manufacture, and it is not made in too large heats or ingots, and when piping and segregating are avoided by confining the finished product to that produced from the bottom two-thirds of the ingot, we have an admirable product for many purposes.

CHROME-VANADIUM STEEL ATTRACTS

Chrome-vanadium steel in a profusion of types has of late attracted the attention of automobile engineers. The chrome-vanadium alloys are preferably made in the crucible or electric furnace, although the open-hearth process is also much used for the purpose. The open-hearth product, I believe, is somewhat uncertain, and while, for example, an open-hearth chrome-vanadium spring steel may be better than plain carbon-crucible spring, it is not to be compared with genuine crucible chrome-vanadium steel when properly melted. For excellent quality, this product constitutes the highest attainment of the steelmakers' art.

These alloys are in general made in a high carbon type, suitable for oil-hardened gears and springs, and in several low-carbon types, such as a case-hardening type for gears and a type suitable for oil quenching, followed by annealing for axles, shafts and steering knuckles. By judicious blending of chromium and vanadium and adjustment of the manganese and carbon one cannot only obtain all static properties that can be obtained from nickel, chrome nickel or silico-manganese alloys, but in addition obtain dynamic or anti-fatigue qualities far in excess of those displayed by any other alloys.

From a wide experience with all types of alloys, it is my opinion that where a better material than the best nickel steel is needed, and especially when dynamic excellence is sought, the appropriate types of vanadium-chrome steels may be unreservedly commended. They forge well and machine more readily than chrome-nickel steels of corresponding carbon percentages.

CHROME-NICKEL STEEL PROPERTIES

Chrome-nickel steels are usually made in a high and a low carbon type. The former is used for the oil-hardened gears and springs, and the latter for general structural purposes, such as axles, shafts, forged parts, and for case-hardened gears. The high-carbon type carries about 1-2 per cent of carbon, and the low-carbon alloy 1-4 per cent; the nickel as supplied by various makers varies from 2 to 3 1-2 per cent, while chromium from 1 to 1 1-2 per cent is usual. A nickel-chrome tungsten steel is sometimes used for springs. In general, nickel-chrome steels possess excellent static qualities, but the difficulties in heat treatment, forging and machining lead one to prefer the other type of alloys mentioned. Equally good physical characteristics can be obtained more cheaply in first cost and in shop costs from nickel or chrome-vanadium alloys. I shall speak later of the relative merits of these steels for oil-hardened gears and springs.

Silico manganese and silico chrome in medium carbons have had considerable popularity abroad for springs and gears. They also are made in low carbons. Their relatively low cost favors their use but their feeble resistance to shock and sensitiveness to heat treatment limit their use. When handled with great care they give good results in works well equipped for obtaining accurate results in their heat-treating operations.

Chrome steels in high carbons are much used for balls and ball races.

TUNGSTEN STEEL FOR MAGNETOS

Tungsten steel of special analysis is universally used for making magneto magnets. All statements and opinions to the contrary notwithstanding, the magnet steel now made in this country is rarely equaled in quality by foreign products. If foreign magnetos are superior to domestic ones it is because of their mechanical construction, and not because they possess, in general, better magnets.

The best alloys are none too good for automobile construction. When one has secured the best the market affords, the first step only has been taken to produce good parts. Next come the forging and machining and the heat treatment, for better or worse. It is money wasted to buy good alloys unless one is willing to study them sufficiently to know how to treat them and then to supply adequate facilities for so doing. It is not to be expected that small users will install complete testing laboratories, but a few pounds invested in having occasional tests made will be well spent. There are, however, many large concerns that could, and should, spend, say, $5,000, for which it is believed the whole, or a large part, of the following equipment could be obtained: An (ordinary) tensile machine, a microscope, electrical or gas furnaces capable of fine regulation, and a good pyrometer, preferably self-recording. The tensile machine can also be used for making Brinnell hardness tests, spring-deflection tests, etc.

In addition to these, some form of drop-testing machine, such as the Fremont, will be found valuable; a vibratory or repetitive impact test is nowadays considered a necessity; while cold-bending and torsion apparatus is useful. This equipment will be of small use unless a careful, conscientious man of sound judgment be put in charge.

The pyrometer is too often supposed to take care of itself. Too frequently it is never questioned, never calibrated. The best pyrometer of the thermo-couple type should be looked over at stated intervals, especially if in constant use. Protecting tubes should be frequently examined and renewed, and electrical contacts looked over, and occasionally the milli-voltmeter also should be tested. If one cannot afford a good pyrometer let him stick to the trained eye of a skilled man, but if he has a good pyrometer let him employ a skilled man. With it one can at least give orders in temperatures rather than in heat colors, and the laboratory and works can meet on an intelligent basis. Heat-treatment operations depend upon a solid scientific basis. By this I do not mean that steel essentially of inferior quality should be made to pass muster by heat treatment. On the other hand, however, it might be said that alloy steel in its so-called natural state, as it comes from the rolls, hammer or drop forge, is almost unfit for motor chassis construction.

DYNAMICAL EFFECT OF ALLOYS ON STEEL

Steel which depends upon alloys for a high elastic limit in its natural condition will have much less elongation than the same steel oil-tempered and annealed. For example, a chrome steel gave in its rolled condition 158,000 pounds elastic limit and 5 per cent elongation, with 9.4 per cent reduction of area.

The same steel oil-tempered and annealed gave 153,000 pounds elastic limit, 14 per cent. elongation and 52 per cent, reduction of area. In other words, the material was transformed from brittle to tough, from treacherous to safe, without materially affecting its elastic limit. A nickel steel similarly treated had its elastic limit raised 20 per cent., with the reduction of area improved and its elongation unchanged.

CASE-HARDENING VS. OIL-HARDENING

In the automobile trade there have existed two schools, so to speak, one believing in the case-hardened type of gear, and the other in the oil-hardened type. As previously mentioned, the chrome-vanadium, chrome-nickel and silico-manganese alloys are

made in both high and low carbons. The former contain about 0.45 to 0.60 per cent carbon and enough other hardening elements, so that by merely quenching in oil from a bright red heat a surface hardening is produced sufficient for ordinary wearing purposes, while the hardness does not penetrate deeply into the gear, but leaves a core that is tough and strong.

The low-carbon alloys, with about 0.20 per cent carbon, require to be carbonized or case-hardened in order to produce sufficient surface hardening for wearing purposes after hardening. Several years of observation and contact with the motor trade lead me to prefer the case-hardened gear.

CONCLUSIONS FROM TESTS DATA

The result of direct tests upon thousands of gears of both types leads me to the following conclusions:

(1) The static strength of a case-hardened gear is equal to that of an oil-hardened gear, assuming in both cases that steel of the same class and appropriate analysis has been used, and that the respective heat treatments have been equally well and properly conducted.

(2) Direct experiments proved that the case-hardened gear resists shock better than the oil-hardened.

(3) As regards resistance to wear, the same type is incomparably better, although perhaps not as silent in action.

One of the leading makers of gears has proved this to his own satisfaction of late by an arrangement of shafts and gears whereby energy is transmitted through two case-hardened gears, in mesh with each other, to two oil-hardened gears. The gears are of the same size. The conditions of the test were severe. Five sets of the oil-hardened gears have already been worn out, while the original case-hardened gears are still in service, and show the tool marks.

Many people have a strong objection to case hardening. In most cases this is doubtless due to the fact that the operation of case hardening has not been reduced to a science. The depth of the "case" and the relation of same to the core; the time and temperature to produce certain results and the exact control of these conditions, together with an accurate knowledge of the material to be treated, are factors that enter into successful case-hardening practice. Points in favor of this method are easier machining of the blanks, and at least equal static and dynamic properties with less chance of injury in hardening.

BILLET-CUT GEARS VS. DROP-FORGED BLANKS

Parts like spur gears, bevel pinions and many shafts may either be drop-forged or cut from bars in automatic machines. Contrary to general opinion, many parts can be machined out of bars as cheaply as they can be from forgings. Moreover, I am firmly of the opinion that no steel is improved physically by drop forging, some steels, however, being less susceptible to injury than others.

In good steel-mill practice great attention is paid to proper finishing heats, and steel is brought gradually to size. In drop-forging work, in order to give sufficient plasticity to assume various forms in dies, it must be heated very hot. It is then frequently formed with the fewest possible blows. An investigation of drop-forged and bar-cut gears, the former being the product of one of the foremost drop-forging companies, showed, as the average of many tests, that under static test the bar-cut gears were fully 25 per cent. stronger, and their resistance to shock test was also much better. The difference cannot be exactly stated in percentage.

CASE HARDENING A SCIENCE

In reference to the proper procedure in case hardening, Dr. Guillet says:

As is well known, the operation of case-hardening consists of placing a steel in some medium capable of imparting carbon to it, at a suitable temperature. After a sufficient interval a steel is obtained the interior of which possesses the same percentage of carbon as before case-hardening, but the exterior of which is much higher (0.80 to 1 per cent.).

On quenching such a steel an extremely high degree of mineralogical hardness is obtained on the surface, while the center of the piece is non-brittle—that is, if the operation has been properly carried out. One generally uses steels containing 0.10 to 0.25 per cent. of carbon for case-hardening.

In order to avoid all brittleness in the interior and exterior of the piece, and at the same time to obtain a high degree of superficial hardness and a very regular degree of carburization (in carbon steels) it is necessary:

(1) To use a steel containing less than 0.12 per cent. of carbon, and with a low percentage of manganese (less than 0.30 per cent.); and

(2) To case-harden with a chemically definite material such as a mixture of 60 parts of charcoal and 40 parts of barium carbonate at a temperature between 1,550 deg. and 1,900 deg. F.—the higher the temperature the more rapid the case-hardening—and allow it, after the operation, to cool down just below the transformation point (about 1,100 deg. F.).

(3) To reheat the piece and quench it at 1,650 deg. F. (just above the transformation point of the center), this operation having the effect of rendering the center fibrous.

This operation has the effect of toughening the center, but the outside will be coarse-grained and brittle. The next operation, according to Guillet is:

(4) To quench for a second time at 1,475 deg. F. (above the transformation point of the exterior), to render the skin non-brittle.

In any case, the methods by which it is possible to obtain, with low-carbon steel, case-hardened pieces which shall not be brittle, are exceedingly delicate.

How different this is from the operation one too often sees, where the pieces are dumped directly from the case-hardening boxes into water!

HARDENING OF NICKEL STEEL

If one uses a good grade of nickel steel, low in carbon, the "case" hardens at appropriate temperatures. If one then takes the precaution to cool off in the boxes before heating for quenching, and then hardens at about 1,475 degrees Fahr., the results will be fully as good as, or better than, can be got by the most careful handling and double quenching of carbon steels. The saving in cost of the operation can be applied toward the greater cost of nickel as compared with case-hardening steel.

Better still, however, if nickel steel be used, is to give it a double quenching, too; then one obtains a really admirable product of extraordinary toughness and wearing qualities.

An ideal way of making nickel-steel gear consists in first annealing the blank, then rough machining, approximately, to size, and giving a light reannealing before taking the last finishing cut. Then pack in suitable mixture and carbonize to a depth of 1-64 to 1-32 inch, according to requirements, at a temperature of about 1,625 to 1,650 degrees Fahr. Cool in the pots, heat to about 1,500 degrees Fahr., and quench in hot brine or a calcium-chloride solution. This will put the core into excellent physical condition. Finally, reheat to 1,375 to 1,400 degrees Fahr., and quench in oil. The last operation will refine the grain of the case and harden it with best results.

It will be noticed that the temperatures for treating nickel steels are considerably lower than those advocated by Dr. Guillet for carbon steels. If methods like these be followed it is not likely that a very great difference would be noted between bar-cut gears and gears cut from drop-forged blanks.

In the case of medium carbon gears not to be case-hardened, but oil-hardened only, one would probably find a greater difference, and in this case we have no opportunity to restore the overheated forged blank by scientific heat treatment.

This, in addition to the greater chance of overheating and the greater difficulty of machining, also favors the use of case-hardened gears, assuming the case hardening is to be skilfully done.

MANGANESE SULPHIDE IN STEEL

To settle the question whether the dark gray substance, identified by Arnold and others in broken steel rails, is really manganese sulphide, as believed, Fay (according to *La Metallurgie*) prepared the sulphide by precipitation and incorporated it with iron in an electric furnace in such proportion that the mixture contained 0.08 per cent of sulphur. Under the microscope the metal exhibited the compound observed by Arnold. The greater part of the sulphur is retained by the manganese, the small remainder combining with the iron being disseminated through the mass of metal in the form of small grains which are uninjurious, so that a steel may contain up to 0.55 per cent of sulphur, and still be forgeable. On the other hand manganese sulphide is particularly harmful, the small particles elongating when the metal is rolled and forming starting points of subsequent fissures.

RECENT CLUB ACTIVITIES

A.C.A. GOVERNORS AND LAW COMMITTEE MEET

At a meeting of the governors and the law committee of the Automobile Club of America, held on the 11th inst., Congressman Olcott's bill, H. R. No. 1066, providing for federal regulation of automobiles engaged in interstate commerce or the postal service, was approved and its adoption by Congress urged.

With reference to proposed New York State legislation, the club has adopted resolutions favoring propositions as follows:

(1) An amendment of the existing law is preferable to the enactment of an entirely new automobile statute.

(2) A reasonable tax, based on horsepower, A. L. A. M. rules, is the fairest way of supplying revenue to the State.

(3) A reciprocity provision is desirable whereby cars owned and licensed in other States may be operated in this State under the home license, provided the home State allows cars owned and licensed in New York State to operate therein under the New York license.

(4) Professional chauffeurs should be required to take out a license. Owners should not be required to do so.

(5) The examination of owners of machines, or of chauffeurs with respect to their ability to run a car, is not practicable in such a way as to be productive of any useful results, but

(6) All licenses to whomsoever granted should be subject to suspension or revocation by some State authority either upon the recommendation of any Magistrate before whom the offender has been tried or upon its own volition whenever, after examination, any holder of a license is found to habitually operate in a way to endanger the life and safety of others.

(7) All license fees and fines and penalties collected for any violation of the law should be transmitted to the State Treasury within a reasonable time, and the proceeds of all license fees and penalties should be used by the State for the maintenance of its improved highways.

(8) The identification of cars should be made easier by enlargement of the number, from 3 to 5 inches in height, and by a requirement that at night the tail light should be so adjusted as to illuminate the number plate.

(9) Reasonable speed in lieu of arbitrary limits is still the desideratum.

(10) Any charge for registration designed for revenue should be collected on the ownership of the car, and be independent of the license fee required of drivers, which should be retained in a figure sufficient to pay the cost of issuing the same.

(11) Penalties should be measured to some extent by the violation, and in trivial cases should be supersedable in the Magistrate's discretion by an admonition.

(12) The function of bail is not punishment of an offender, but solely to insure his attendance in court when required; except in cases of accident, bail should not exceed $100 in amount and should be a matter which the Magistrate may dispense with, and, except in cases of accident, the Magistrates in the city, as well as in the country, should dispose of the case forthwith and summarily either by the imposition of a fine or by acquittal.

(13) Arrests in trivial cases should be superseded by a provision for service of summons or notice.

PHILADELPHIA LADIES' CLUB INSTALLS OFFICERS

PHILADELPHIA, Feb. 21—This "City of Automobile Clubs" has just witnessed the installation of the officers recently elected to guide the destinies of the Quaker City Ladies' Motor Club during next twelvemonth. They are: Mrs. Joseph J. Martin, Jr., president; Mrs. William Ingram and Mrs. Charles Snyder, vice-presidents; Mrs. H. B. Finck, secretary and treasurer, and the following board of directors: Mrs. Mary Martin; Mrs. Charles Murtha, Dr. Chatharine Sweeney, Mrs. David Ward, Mrs. O. W. Schaum, Mrs. M. L. Wallace, Mrs. Richard Filbert, Mrs. C. Kugler, Mrs. Stoerr and Mrs. Herbert Reading. The club's cozy quarters at the Hotel Majestic were tastefully decorated for the occasion.

CAMDEN, S. C., WANTS AN AUTOMOBILE CLUB

CAMDEN, S. C., Feb. 21—Dr. John W. Corbett and a number of other autoists at Camden, S. C., are making an effort to organize an automobile club. Camden and the country around has a goodly following of autoists, and that the venture will turn out to be a success is now assured. The question of association with the A. A. A. is also to be taken up, and it is the intention of the autoists around Camden to make a progressive campaign for good roads, equitable laws, and such other conditions as will add materially to the benefits which the automobile is bringing to the South.

LOUISVILLE CLUB WANTS MEMBERS BADLY

LOUISVILLE, KY., Feb. 19—Four hundred members by May 1 is the slogan of the Louisville Automobile Club. At present there are 343 members, and it is not expected that any great difficulty will be experienced in securing the additional members.

Officials of the Louisville Automobile Club returned from Chicago with the assurance that Louisville is to be included in the itinerary of the Glidden tour this year. The whole South is looking forward eagerly to this event, and it is expected that it will cause a great boom in automobiling in this district.

LAW AND THE AUTOMOBILE

COLUMBUS WANTS STATE LAWS BEFORE NATIONAL

Columbus, O., Feb. 14—At a special meeting of the Columbus Automobile Club a strong sentiment developed against the enactment of a federal registration law, such as is asked for by many members of the A. A. A. Discussion was produced showing that a federal registration act would benefit a comparatively small number of autoists, but that more benefit could be gained by working for uniformity in State automobile laws. To that end the request of the A. A. A. was laid on the table.

Secretary of State Carmi A. Thompson of Ohio has been invited to make an address at the convention of the National Automobile Owners' Association, to be held in Washington, D. C., February 15 to 17. At that time he will express the views of auto owners of the State on a federal registration act.

A large number of the members of the club are strongly opposed to having a race meet this year, as all meets in the past have proven failures financially. Some will make an effort to arrange a 24-hour race, however.

The show committee reported that 12,598 people were admitted to the automobile show and that the receipts from admissions and show space were $10,049.71. The expenses were $9,110.51, leaving a balance of $939.20. It was decided to hold another show next Winter. Plans were laid for an orphans' day, and a larger number of cars than ever before has been offered, so that the outlook is very favorable.

WAYNE COUNTY LEADS MICHIGAN IN STATE ROADS

LANSING, MICH., Feb. 21—A total of $381,455 has been expended by the State as rewards for the construction of county roads since the establishment of the State Highway Commission in 1905. The commission states that a total of 522 miles of State road have been built in the past four and a half years.

Since July 1, 1909, 160 miles have been built, making a total of nearly 400 in the entire past year. The majority of roads are constructed of macadam, the most expensive material, and the remainder are of stone and gravel. The fact that this is so is encouraging to the commission and proves that the counties are decidedly in favor of the best roads. Sixty counties are on the State reward list. The remaining counties have not yet applied for the privilege, but there are numerous applications on file for the building of new roads next Summer from these counties.

In the past fiscal year $116,604 has been paid by the department in State rewards. The average cost of building one mile of macadam road is $3,800; of gravel roads, $1,700. The State reward for one mile of macadam road is $1,000. For one mile of stone and gravel $750 is paid, for one mile of gravel road $500, and for one mile of clay gravel road $250. Those counties building the most roads under the State reward law are: Wayne, Port Huron Township, in St. Clair County, Saginaw, Bay, Grand Traverse, Manistee, Mason, Muskegon, Oceana, Kalamazoo, and all through the upper peninsula. In Kalamazoo preparations are being made to build 32 miles of State road in the coming Summer. In these counties the roads are almost without exceptions constructed of macadam.

WASHINGTON STATE PLANS A LONG TRUNK ROAD

SPOKANE, WASH., Feb. 11—Eleven hundred miles is the total length of the State trunk road planned for Washington by Governor Marion E. Hay, who was at Spokane conferring with officers of the Spokane County Good Roads Association, January 19 to 21. The road is designed to serve 75 per cent. of the population of the State, now estimated to be near the 1,250,000 mark, and will touch 11 cities, also taking in a large number of smaller towns between Spokane and Puget Sound.

The legislature appropriated $640,000 for state roads in 1909, but the money was spent in various places in the State, where sections of the proposed State road do not join. This year a tax of one mill has been levied, and it is estimated, and with the assessed value of the State at approximately $900,000,000, this will bring in $850,000 at least for use in improving roads. With this amount on hand some definite plant for a continuous State road can be made.

The largest appropriation ever made before by this State for roads was $225,000. Seventeen appropriations were made for improvement of State roads in 1909, but in no instance were these roads connected. It is believed a route should be selected for a State road that would best accommodate the largest percentage of residents and then every effort be used in a continuous betterment of that routed road.

The route, as now planned, will pass through or near Bellingham, Everett, Seattle, Tacoma, Centralia, Chehalis, Vancouver, Walla Walla, Spokane, Wenatchee, Ellensburg and again to Seattle. A road following this route would accommodate 75 per cent. of the people of the State.

The Northern Pacific railroad has promised to give six miles of an old roadbed in the southern part of Lewis county for a State road which will be a considerable help.

SHOW BREVITIES

LOUISVILLE SHOW SPACE ALL TAKEN NOW

Practically all of the space has been taken for the third annual automobile show of the Louisville Automobile Dealers' Association, and it is expected that more space will be applied for than is possible to furnish. The exhibition will be held in the First Regiment Armory, March 17, 18 and 19. The committee in charge of arrangements have many details yet to work out, but it is announced that the display of motor vehicles will rival those of larger cities. The displays will be so arranged that those seeking information about cars they propose to buy or even concerning machines they own can be gained without the least amount of trouble or delay.

The building committee has hit upon an unique plan for arranging the floor space, and one which is declared satisfactory to all prospective exhibitors. The main aisle instead of running through the middle of the big building will take the form of a rectangle and enclose 12 large spaces. This central division will run from the main entrance, on the south, to within 15 feet of the balcony line, on the north. To the east and west of the broad aisle surrounding these central spaces will be located all other spaces for the display of automobiles. This arrangement gives every exhibit equal prominence. The north end of the armory will be reserved for the exhibits of accessories. It is expected that more than 100 cars representing practically every important type of car will be represented.

ROAD BUILDING NEWS

LEGAL OBSTACLES TO ROAD BUILDING REMOVED

INDIANAPOLIS, Feb. 21—The indications throughout Indiana now are that there will be a general resumption of township road building under the township gravel road law. The law has just been declared constitutional by the Supreme Court, in a reconsideration of the case appealed from Hamilton County. Many contracts throughout the State were in progress when the former decision was handed down and these were stopped. County treasurers refused to pay money as interest on bonds issued in the past, and Boards of County Commissioners refused to consider further issuance of bonds under new contracts. The decision of the court removes all question of the validity of the act, and has the effect of placing the stamp of supreme legal approval on all acts performed under the law. According to the act an entire township may be taxed for the building of a free gravel road on petition of a majority of the land owners affected by a stretch of highway to be constructed or improved when petition is made according to law.

THOUSANDS OF FARMERS FAVOR ROADS

Representative of the remarkable progress in the campaign for better highways, 1,000 farmers and automobilists of western Kentucky are preparing to visit Mayfield, a thriving town in southwestern Kentucky, on Thursday, February 24, and march to the court house, where the fiscal court will be in session that day. The purpose is to ask the court to take immediate action in the way of building gravel roads in that section. The farmers offer to pay half the expense in work and subscription.

EQUITABLE CONSTRUCTION OF LAW OF REISSUE

JUST at this time, when the atmosphere is clouded by many issues, and the patent situation is uppermost in the minds of the men who have to do with the automobile and its ramifications, legal issues will be exploited in the press and many of the ideas which will be advanced will apparently be in conflict with each other. In the long run, the law of common sense, which is the under strata of common law, will have much to do with the settlements which will have to be made and subterfuge, while it is frequently embellished with gay plumage, rambles around sad at heart, realizing the while that the cold hard facts will serve as a stone wall and arrest further effort.

At this time it is believed that the question of reissue will be of the greatest value, and while it has divers angles, each one of which may have to be considered, for the present it will be enough to quote Renwick on patentable invention, page 151, paragraph 106:

"From the considerations previously set forth it would appear to be but just to the inventor and patentee that the construction of the law of reissue should be substantially as follows:

"1. That a patentee who holds a patent that is inoperative by reason of a specification defective or insufficient to protect the full real invention made by him previous to the date of filing his application for the original patent, or who holds a patent that is invalid by reason of his claiming as his own invention or discovery more than he had a right to claim as new, may legally apply for a reissue thereof with either an enlarged claim (in the former case), or with a reduced claim (in the latter case), and at any time within the term of the patent, provided the error has arisen by either inadvertence, accident, or mistake and without any fraudulent or deceptive intention; and provided further that the delay in making the application for the reissue is not unreasonable under the circumstances of the particular case.

"2. That the invention described and claimed in the reissue of the original patent is not to be restricted to merely the same invention which is claimed in the original patent, or even to identically the same intention which is set forth in the descriptive text of that patent, because either or both may be defective or insufficient; but is to be the same invention which the patentee invented or discovered as provided in section 4886 of the patent law as the condition precedent to obtaining the original patent.

"3. That if the thing correctly described and claimed in the reissue patent is found described in the descriptive text of the original patent, or is represented in the drawings thereof, or is embodied in the model or in the sample which the patentee filed in the Patent Office with his application for the original patent, either fact is conclusive evidence that the thing so claimed in the reissue is 'the same invention' specified in the statute for which the reissue may be legally granted; provided it was new as respects the state of the art, and was original with the patentee at the date of filing his application for the original patent.

"4. That the provision of the statute prohibiting the introduction of 'new matter' into the corrected specification of the reissue does not prohibit the introduction of matter which was omitted from the descriptive text, or from the claims of the original specifications, or from the drawings, by inadvertence, accident, or mistake, and without any fraudulent or deceptive intention, when such matter is found in either the model or sample, or in the drawings, or in the descriptive text of the original patent or of the application therefor on file in the Patent Office; but prohibits only the introduction of matter which is not found in substance in any one of these at the date of the original application, and which in such case is to be construed under the statute as not forming part of the original invention or discovery at that date.

"5. That, in accordance with the last clause of § 4910 of the Patent Law, matter new as compared with the specifications and claims of the original patent or amendatory thereto may be introduced into the corrected specification of the reissue of any other than a machine patent when there was neither model nor drawing filed in the Patent Office with the application for such other patent, 'upon proof satisfactory to the Commissioner that such new matter or amendment was part of the original invention, and was omitted from the specifications by inadvertence, accident, or mistake as aforesaid.'

"6. That the fact that an original patent is operative to the extent of what is described or claimed therein, is not satisfactory evidence that the patent is not inoperative by reason of a defective or insufficient specification to protect the full invention made by the patentee and which he intended to patent, and which he has a legal right to describe and claim in the corrected specification of the reissue, because it does not follow that when a patent is operative to protect a part of an invention it is not inoperative to protect the entire invention.

"7. That in accordance with the earlier decisions of the United States Supreme Court, the fact that a patentee has failed to claim in his original patent a material part of his real invention by reason of inadvertence, accident or mistake, and without any fraudulent or deceptive intention, is not a dedication of the unclaimed part to the public, which acts as an estoppel to the reclamation of such material part by a reissue.

"8. That the fact that some unlicensed party has engaged previous to the reissue of a patent in the manufacture of things embodying the part of an invention unclaimed in the original patent but subsequently claimed in the reissue of it, does not of itself render the reissue invalid, and is not conclusive evidence that there is an unreasonable delay in applying for the reissue.

"9. That if equity requires that a party who has engaged in nocently, before the application for a reissue, in the manufacture of things embodying only the part of the intention claimed in the reissue, should be permitted to continue the manufacture of the same articles subsequent to the reissue, then such party should be deemed to have acquired by reason of the delay of the patentee to reissue an equitable license to continue to make, use and vend to be used the same articles after the grant of the reissue. But the fact of such acquirement of an equitable license by such innocent party does not apply to nor inure to the benefit of any other party who engages in such manufacture subsequent to the date of application for the reissue and who infringes any one of its claims.

"10. That when claims and statements of invention are made in a reissue patent which are broader in scope than those made in the original patent, the fact that any claims, or any statements of invention, or both, of the original patent recite only a part of what is claimed in the reissue should not be construed into evidence that the patentee intended to patent no more than what is so claimed or set forth in the original, provided the inventor has sworn to the correctness of the reissue. On the contrary, the inventor's oath to the application for reissue should be considered as prima facie evidence of the correctness of the claims and statements of invention set forth therein, and the burden of proof to the contrary should lay upon the defendent in a suit.

"As to this last proposition it is a fact well known to all who act as solicitors of patents that an inventor always intends to claim in his original patent everything that is new in what he has done in view of the state of the art at the date of his invention. To presume that an inventor who has taken out a reissue with broader claims that existed in his original patent did not so intend at the time of his application for the latter and that he intended by his original patent to dedicate the unclaimed part of his real invention to the public, is to presume that every such inventor (using the classic language of the workshop) 'knew himself,' at the date of his original application, 'to be a born fool,' who voluntarily abandoned that which the law gave him the right to claim for himself; a presumption which is irreconcilable with the universal laws of human nature and with common sense.

FIRST SALT LAKE SHOW IS OPEN

SALT LAKE CITY, UTAH, Feb. 19—A new epoch in the local history of the automobile was inaugurated to-night by the opening of Salt Lake's first automobile show, in the Auditorium. There were none of the characteristics of an initial attempt visible, and, although but one day was allowed for the installation of the decorations, everything was complete. The decorations are mostly in light colors, the scheme being white and pale blue. Imitation marble pillars mark out the aisles, set amid masses of palms and flowers. Under a flood of electric light the effect is gay and summer-like.

The representation of different cars embraces the most varied types, the two extremes being the Brush runabout and the Chadwick "Great Six." The latter car is expected to enter in a number of competitions to be held during the summer. The Hupmobile had a good exhibit, and other comparative newcomers to the trade were the Everitt and the Warren-Detroit. The Botterill Automobile Company had a fine display of Pierce-Arrows, one of which was lent for the occasion by Mayor Bransford. On the same stand appeared the Pope-Hartford, interesting because of its victory at Portola. Chalmers-Detroit had a 30-horsepower touring car and a pony tonneau, and Hudson both the roadster and the new touring car. Moon was represented by the new 30-horsepower car.

The management is receiving much commendation for its quick work in preparing the show. The Auditorium was in use for other purposes up to midnight of the 18th. Five minutes later a force of 50 men was busy installing the decorations, which, of course, had been prepared outside.

BIG RALLY AT MILWAUKEE SHOW

MILWAUKEE, Feb. 21—The second annual automobile exposition of the Milwaukee Automobile Club, which opens in the new $500,000 Auditorium in Milwaukee, Wis., on the night of Washington's Birthday, will be the occasion for a big rally under the auspices of both the local club and the Wisconsin State Automobile Association, which are closely allied. President M. C. Moore, of the State body, will promote several extensive tours before the meetings of the various committees, while Secretary James T. Drought will lead a discussion of legislation, good roads, etc. Sessions will be held in the headquarters of the club, on the second floor of the Auditorium annex, which has been reserved for the use of members.

The dealers who will hold private shows are organized and their publicity of their shows and general work against the club show have created some feeling. Milwaukee business men have stepped in, fearing the split will be very hurtful.

MANY NEWCOMERS AT BALTIMORE

BALTIMORE, Feb. 21—There will be many cars new to Baltimoreans seen at the Baltimore show, which takes place at the Fifth Regiment Armory from the 22d to 26th, inclusive, of this month. These cars are the ones that have just established agencies here since the show of last March. Among those to be mentioned are: Washington, Apperson, Parry, Knox, Marion, I. H. C., National, Matheson, Stearns, Mercer, Alco, Velie and Dumont, Kline Kar and Manhattan truck, Rider-Lewis, Moline, Crawford, Chadwick, Rainier, E-M-F, Flanders, and Hudson.

MILESTONES FOR THE AUTOMOBILIST

Feb. 19-26.....Minneapolis, Minn., Third Annual Automobile Show, Minneapolis Automobile Association. Walter R. Wilmot, Chairman, Hotel Nicollet.

Feb. 19-26.....Newark, N. J., Essex Troop Armory, Automobile Show, New Jersey Exhibition Company.

Feb. 19-26.....Los Angeles, Cal., Hamburger Building, First Annual Show, Licensed Dealers of Los Angeles.

Feb. 19-26.....Salt Lake City Auditorium, Automobile Show, Utah Automobile Dealers' Association. W. D. Rishel, Manager, 1-5 East First South St.

Feb. 19-26.....Cleveland, Central Armory, Annual Automobile Show under auspices of the Cleveland Automobile Show Company. H. M. Adams, Secretary.

Feb. 21-26.....Cincinnati, Music Hall, Automobile Show, Automobile Club of Cincinnati. Jesse Lippencott, Chairman Exhibits Committee, Gibson House.

Feb. 22-26.....Baltimore, Second Annual Automobile Show, Auto Club of Maryland, Fifth Regiment Armory.

Feb. 21-26.....Portland, Me., Auditorium, Fifth Annual Automobile Show. F. M. Prescott, Manager.

Feb. 22-27.....Milwaukee, Wis., Auditorium, Second Annual Automobile Show, Milwaukee Automobile Club.

Feb. 24-26.....Binghamton, N. Y., State Armory, Automobile Show. R. W. Whipple, Secretary.

Feb. 24-Mar. 3...Toronto, St. Lawrence Arena, Canadian Automobile Show, Ontario Motor League. E. M. Wilcox, Mgr.

Feb. 28-Mar. 5...Omaha, Neb., Auditorium, Automobile Show, Omaha and Council Bluffs Automobile Dealers.

Feb. 28-Mar. 5...Kansas City, Convention Hall, Fourth Annual Automobile Show, Automobile Dealers' Ass'n.

Mar. 5-12.....Boston, Mechanics' Building, Eighth Annual Automobile Show, Boston Automobile Dealers' Association. Chester I. Campbell, General Manager, 5 Park square.

Mar. 5-12.....Cleveland, Central Armory, Cleveland Automobile Club Eighth Annual Show.

Mar. 5-12.....Des Moines, Ia., Coliseum, First Annual Automobile Show, Des Moines Automobile Dealers' Ass'n.

Mar. 7-12.....Albany, N. Y., Armory, Automobile Show.

Mar. 15-19.....Syracuse, N. Y., State Armory, Automobile Show, Syracuse Automobile Dealers' Association.

Mar. 17-19.....Louisville, Ky., Armory, Louisville Automobile Dealers' Association Annual Automobile Show.

Mar. 21-30.....Buffalo, N. Y., Convention Hall, Third Annual Power Boat and Sportsmen's Show, Buffalo, Launch Club. D. H. Lewis, Mgr., 760 Main St.

Mar. 21-28.....Denver, Col., Convention Hall, Denver Motor Club's Annual Automobile Show.

Mar. 26-Apr. 2....Pittsburg, Pa., Duquesne Garden, Fourth Annual Show, Automobile Dealers of Pittsburg. Frank D. Sauppe, Chairman.

Mar. 26-Apr. 2....Montreal, Coliseum, Motor and Sportsmen's Show. E. M. Wilcox, Mgr.

Apr. 23-29.....Bangor, Me., Auditorium, Second Annual Eastern Maine Automobile and Motor Show. J. Henry Graham, Manager, Old Orchard, Me.

RACES, HILL CLIMBS, ETC.

Feb. 19-20.....Los Angeles, Ascot Park Track, Track Races of Los Angeles Motor Racing Association.

Feb. 22.....Oakland, Cal., Hill Climb, Auto Trades Association of Oakland and Alameda County, Cal.

Mar. 5.....New York to Boston, Voting Trophy Contest, T. F. Moore, Manager, 91 West 103d St., New York City.

Mar. 19.....Altadena, Cal., Hill Climb, Licensed Motor Car Dealers' Association, Los Angeles, Cal.

FOREIGN SHOWS AND RACES

Feb. 18-26.....Manchester, England, Automobile Show.

Feb. 20-23.....Swedish Automobile Races and Trials.

Mar. 19-Apr. 3....Berlin Automobile Show.

Mar. 22.....Monte Carlo Elegance Competition.

Mar. 27-Apr. 4....Prague, Austria-Hungary, Automobile Show.

Mar. 28.....Brooklands, England, Easter Meeting.

Mar. 31-Apr. 8....French Spring Wheel Competition.

Apr. 2-24.....Turin, Italy, Automobile Show.

Apr. 27-28.....Brooklands, England, Two-Day Meeting.

May 1-Oct. 1.....Vienna, Austria-Hungary, Automobile and Aviation Exposition.

May 28-June 9...St. Petersburg, Russia, Automobile Exhibition.

June 2-8.....Prince Henry (German) Touring Competition.

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It may seem a little far fetched to blame the purchaser for the existence of things which fail to sustain the good reputation of the industry, taking it as a whole, but the fact remains that they would not be manufactured were there no prospects of sale. Reform, in so far as this condition is in demand, must come from the fountain head; the purse-string must be tightened until they discourage the undesirable effort.

When a banker wants a cashier, it is the latter who must sustain all his claims of competence; the banker takes his word for nothing; even the bond is scrutinized. The same cautious methods, if they are applied when an automobile is being selected, will lead to no more failures than banks have to put up with on account of dishonest or incompetent cashiers.

There is one characteristic which nests in the breast of every man; it is the very attribute which makes it possible to transfer the title of a valueless thing for money; when we want a thing we want it bad. Caution is the cure—let want wait until caution is satisfied. A man who has never owned an automobile can very well afford to let his funds earn four per cent for a little longer; long enough, in fine, to permit the maker of the automobile to prove his case.

A standard method of accomplishing a given task is good, because it induces a condition of stability, adds to speed of performance, and eliminates error. If a task is performed in some one way, it becomes a habit to continue the process, and habit, if it fastens its fangs upon a performer, no matter what the process may be, acquires a willing slave. There are habits which do no credit to anyone, but the habit of doing a thing in the right way is sure to be induced if the facilities afforded are right.

In an automobile as in everything else, the method of control, to induce habit, must be studied, and that it will be of the greatest advantage to make all control methods on a common basis, is true, for then habit would be acquired by drivers, and in an emergency, from force of habit, the right act would be performed, and safety would be more nearly assured.

That all automobiles relate to each other in some particular goes without saying, but differences, of which there are many, creep into the respective designs so freely that it becomes extremely difficult to realize by what method averages of all can be made to serve a good purpose. In a cylinder, if the mean effective pressure is determined, it gives a means by which the power of the motor may be resolved, and when the value of an alternating current of electricity is being investigated it is necessary to take the square root of mean square of the instantaneous values to evolve the results desired.

When all the motors of the year are taken and averages are struck, the result is something new; it is not representative of a single motor of the whole number taken, and, after more than a little deliberation, the inclination is to enquire what does this average represent?

In taking all the designs into account during the process of averaging, it is necessary to include the designs which are below standard, and to whatever extent they are inferior they drag the average down; is it proper to do so? One way of viewing it leads to the answer yes; every art has its good and its bad; the art is influenced by both; unless the bad can be eliminated it must be included; an average of the good and the bad will be superior to the one and inferior to the other; it is as a gain, on the whole, to advance the bad to the average, at the cost of the good.

The owner of an automobile, if he takes advantage of wisdom, must regard personal safety ahead of many other considerations. If he has an exaggerated ego to the high disregard of personal safety, then, the safety of others, if it is taken into account, will show, at least, that he is endowed with a spirit of consideration for his neighbors. When an automoble is new, if it is reasonably well made, it may be speeded to the maximum of its ability, but as age overtakes it, unless the power plant deteriorates in about the same ratio as the car as a whole, the time may arrive when the effect of speed upon the strain members will make its mark. The greatest chance for trouble of the character which may end in the loss of life will follow when a touring car is used for two or three years and then put through a process of repair with the object of turning it into a racing automobile, which process is ended by the simple expedient of overhauling the motor, removing the heavy touring body, and substituting a light one. True, the speed of the car will be increased, but the strains induced in the parts will increase as square of the speed.

STATEMENT FROM A. L. A. M. ON PATENT SITUATION

BEFORE GOING ABROAD, COLONEL CLIFTON MAKES A DECISIVE AND AUTHORITATIVE STATEMENT OF THE PRESENT AND PROSPECTIVE PATENT SITUATION

WITH a campaign of education that is expected to be of far-reaching effect, those interested in the Selden Patent are endeavoring to show car buyers the many advantages of buying cars licensed under that patent which Judge Hough in the United States Circuit Court of New York held recently to be valid and to cover the modern gasoline automobile.

For the first time since the decision, Charles Clifton, the president of the Association of Licensed Automobile Manufacturers, has consented to talk on the subject. Among other things in the interview given out yesterday he says:

"Many promoters, pointing to the profits made by a few of the old-time manufacturers, encourage the formation of companies and try to induce innocent people to place their money in the enterprises, holding before them the alluring idea of getting rich over night. Such affairs it seems to me, are doomed to failure and the stockholders are almost certain to lose every dollar they supply.

"The success of a few old companies, headed by excellent business men, has induced others to start manufacturing, ever since Judge Hough's decision. Some of them may propose to put out good cars and others to put out inferior cars. Scores of such companies may not get beyond the experimental stage and many who do get out a few cars may depart from this business life, leaving behind them products for which no parts can be obtained. Those who would start companies at this time forget that the makers now getting profits from the business are old-timers, who after years of work, have built up a line of tried products and an organization for handling them, which cannot be duplicated without a great amount of work at this keen competitive period of the industry.

"Some patent attorneys, not appreciating the importance of the decision, or for other reasons," continued Mr. Clifton, "have evidently encouraged people to manufacture cars in the face of this decision; a procedure which may result in a heavy loss for those endeavoring to enter the field at this late date.

"The trade is well informed on the patent question, and since the decision, more than forty concerns have applied for and have been granted licenses. The Association of Licensed Automobile Manufacturers has the right through its Executive Committee, to say who shall and who shall not be granted the protection of the patent, although the licenses are granted by the patent owner, the Columbia Motor Car Company.

"On the other hand some innocent buyers of motor cars have failed to appreciate the importance of Judge Hough's decision and have bought cars that infringe the patent. How unnecessary it was for them to purchase such cars is evidenced by the fact that 76 standard American cars and two imported cars are now licensed. These factories are producing cars of all classes and for all prices, from $485, the lowest-priced car in America, to the most luxurious machine of the automobile and coach-builders' art, with the makers in strict competition with each other, a fact well known by the trade and buying public.

"In the buying of cars it can be readily seen that there is no occasion, with almost every important maker having a license, for any person to take chances of litigation by the purchase of an unlicensed car, to say nothing of the difficulty of trading that car in exchange for a licensed car when a new purchase is contemplated," added Mr. Clifton. "Last year the licensed manufacturers made almost 95,000 cars, or about 85 per cent. of the estimated production and this year are expected to market not less than 160,000 machines.

"With a view of protecting the public and thereby increasing the popularity of the automobile, it has not been the policy of those who controlled the patent, to extend its protection to new and untried, or doubtful products.

"One shouldn't be pessimistic on the future of the automobile, but it doesn't take much of a prophet to figure that the going concerns in the business to-day, almost all of which are licensed under the Seldent patent, should be fully able to care for the demand for motor cars.

"To prevent the unthinking from investing in new automobile companies or buying unlicensed automobiles," concluded Mr. Clifton, "it is deemed proper to issue this statement so that everyone may be advised as to the facts and past history of the litigation which resulted in Judge Hough's decision of last September, wherein he upholds the validity of the patent, declaring it to cover the modern gasoline automobile. Suits may be brought under this patent for infringement by manufacturers, by dealers, or by users of pleasure or commercial gasoline automobiles, and it is the intention of the owners of this patent to protect the exclusive rights secured by it to those who have become licensees by commencing suits against infringers of it."

INDEPENDENTS EXPECTED TO TAKE APPROPRIATE ACTION

NOW that the A. L. A. M. is indicating by its public announcements the action which is expected of it in view of the decision of Judge Hough of the United States Circuit Court of New York, and considering the fact that the Licensed Association represents only 76 of the total number of automobile makers in this country, it is scarcely news to announce that the independents are quietly looking out for themselves, and while they all evince willingness to join the A. L. A. M. under favorable terms, they are hustling while they wait.

To what extent the new independent organization has assumed definite form it is extremely difficult to indicate, because of the reluctance on the part of the possible members to disclose any of the doings, to some extent, in view of the effect such action might have on the A. L. A. M. when considering membership application, and again in view of the considerable number of unprotected automobile makers who have failed to do anything.

It may be a surprising statement to make, but there are automobile makers in this country who are not at all familiar with the patent situation, and, in some cases, they do not seem to know that there has been a long-drawn-out contest in the courts, and that a decision has been rendered. The organizers of the new independent association point out that headway is slow, and that there is much danger in courting publicity at this time, and they are reluctant to disclose their plans, which, however, according to indications, are well advanced.

In a very few cases, when the newly organized companies discovered that to go into the automobile business these days is to court an action at law, they quietly withdrew from the field, but the many companies with plants on their hands, and product in a half completed state will scarcely be able to back out.

Henry Ford, in commenting on A. L. A. M. attitude, stated to the representative of THE AUTOMOBILE that he will have something to say, which will be the result of sufficient deliberation to make it sound attractive.

DOUBLE SHOWS TO BE HELD NEXT WINTER

MADISON SQUARE GARDEN TO BE REARRANGED SO AS TO GIVE MORE SPACE--COMMERCIAL AUTOMOBILES WILL MAKE UP SECOND HALF OF THE DUAL EXHIBITION

OWING to the many additions to the ranks of the Selden patent licensees, the Association of Licensed Automobile Manufacturers has planned a double show for Madison Square Garden, New York, in 1911. The dates selected are January 7 to 14 for pleasure vehicles, reopening on Tuesday, January 17 and closing on the 24th, for commercial vehicles.

Properly to care for the exhibitors, arrangements have been made by the show committee of the A. L. A. M. to rebuild the interior of the Garden, thereby securing 20,000 square feet more floor space than has been available at previous shows. This will be accomplished by extending the elevated platform so that it will be 50 feet wide, with another platform overhead, extending from the level of the balcony. When this is accomplished and the commercial vehicles are cared for at the second week, the show committee can accommodate 80 exhibitors of vehicles in spaces of the same size as those used at the last show. In other words, the new construction will give sufficient room to care for all the present Selden patent licensees. There will also be accommodations for 27 exhibitors of motorcycles and about 300 motor and accessory manufacturers.

The plan of a double show that will give proper space to the pleasure vehicle makers and care for the fast increasing number of commercial car manufacturers has been the subject of long discussion among those interested, and while the expense and work involved will exceed that of any previous exhibition, the affair is certain to be representative of the industry.

Work will begin early in July on the preparation of the interior construction, which will be made in sections to permit rapid installation. When the pleasure vehicle show closes on Saturday night the pleasure vehicles will be removed and their places taken by commercial cars. The signs and carpets will also be changed, but the main decorations will be carried in both.

Many of the members of the Licensed Association are now turning their attention toward commercial vehicles and will have their products ready for the fall trade and for exhibition at the January show. It is believed that the double show of 1911 will exceed in all respects any previous exhibition of motor-driven vehicles. The contract with the Madison Square Garden Company was signed by President Clifton of the A. L. A. M. before leaving on his southern trip.

FIRST NEWS OF BOSTON'S BIG AUTO SHOW

BOSTON, Feb. 19—When the automobile show followers come to Boston for the last of the "big" motor vehicle displays of the season, that of the Boston Automobile Dealers' Association, which opens in Mechanics Building the evening of March 5, they will be impressed with the fact that the show season has nearly run its course and that the riding season is at hand. Boston's show is the Spring show, the final great assembling of the examples of the year's product, before they go into the hands of the consumers, and the manufacturers turn their attention to the designing of models for the succeeding season. Thus it is appropriate that in the setting of the Boston show the idea of springtime should be emphasized. This is the keynote of the decorative scheme which Manager Chester I. Campbell has prepared. The show will depict a typical New England countryside, garden, orchard and fields, in the Spring of the year.

To carry out this idea to the most realistic point growing plants and flowers are to be used to a degree never before attempted in an automobile show. For months one of the largest conservatories in the vicinity of Boston has had under glass hundreds of shrubs and plants which have been brought along so that they will be in bud and full bloom during show week in Mechanics Building. Apple orchards have been despoiled to furnish the material for the orchard that will be a feature of one department, and many an old fence has been torn down to supply materials for the show. Great paintings, depicting New England rural scenery, have been made, and immense quantities of material are awaiting the day when the building will be given over to the decorators.

Grand hall will be the garden, and exhibition hall, adjoining, the orchard. In grand hall the main divisions between spaces will be of neatly trimmed lilacs in bud and bloom, while spirea covered with dainty white blossoms will make up the side divisions. At the bases of these shrubs will blossom thousands of vari-colored tulips, giving a lively touch of color to the whole. All around the side walls will be panelled paintings depicting rural landscape, while on the stage will be a painting 100 feet long and 25 feet high, forming the background. These paintings are intended to give an appearance of spaciousness to the hall. The floor coverings will be of a mahogany-colored material and numerous gray-green rugs will be scattered about. The signs on wrought-iron standards with white lettering will be in keeping with the decorative scheme as a whole.

The first balcony will have a colonnade with vine-draped rafters extending to the base of the second balcony. Vines in profusion also will be used over the balcony front. The bandstand will be on an elevated platform over the second balcony, leaving the main floor free from this obstruction.

In exhibition hall each of the one hundred or more posts will be covered with bark slabs to give them the appearance of tree trunks. At the tops apple tree branches will spread out, and they will be gay with artificial foliage and apple blossoms. Old-fashioned rail fences will serve as division lines between exhibition spaces, and there will be a painted landscape all around the back wall of this hall. The flooring will be similar to that in grand hall, and the signs will be in keeping with the orchard atmosphere. Illumination will be by electric lamps, which will be used in such profusion that no part of the great hall will be dark day or night.

In the basement there will be a typical New England brick inn to house the restaurant, and the decorations for the overflow pleasure car display and for the commercial vehicle department will be of special design, each post being covered with tapestry finished material and carrying arches that are to be studded with electric lamps. The basement floor coverings will be of the same material as that in the departments on the main floor. For the motor cycle and accessories divisions on the balcony level a decorative scheme in harmony with that below though not as elaborate will be employed.

Those who have seen the drawings and materials for the Boston show decorations are enthusiastic over them and predict that the Boston show of 1910 will be the most successful in the long line of attractive exhibitions that have been held in Mechanics Building. Every inch of space has been sold, and there seems a probability that some of those who were unable to secure space will unite in an independent show nearby.

SOUTHERN CALIFORNIA SHOW SUCCESSFUL

LOS ANGELES, CAL., Feb. 18—The southern California show opened a few days ago in the Grand avenue rink and every indication points to its being one of the most successful exhibitions ever held on the Pacific coast, more than 5,000 people attending the opening. The show colors are green and white and the building is lighted by means of 5,000 incandescents which show to advantage the many beauties of the cars on view. Small cars are in the majority, although the higher-priced models also are in evidence, while the Californians show they are up-to-date by displaying bodies of the gunboat or torpedo type. Walter Hempel, manager of the show, is given credit for producing a most satisfactory affair and as a curtain-raiser yesterday afternoon he had a parade through the city streets of 300 cars, in which the feature was the struggle for the prize offered for the concern having the greatest number of cars in line. This prize was captured by the Standard Motor Car Co., which had fifty Ford cars in the procession, the natty machines coming from San Bernardino, Glendora, Riverside and Redlands. Of the cars on exhibition all of them are well known in the East with the exception of the Tourist, which is a California product and which is shown by the California Automobile Co., which has on view eleven Tourist models as well as showing the Firstone-Columbus torpedo. The Standard Motor Car Co. has the Ford and Velie, the W. J. Burt Motor Car Co. has the Auburn, the Vail Motor Car Co., Pennsylvania; Bosbyshell-Carpenter Motor Car Co., Dorris; W. A. Evans, Waverly electric; Williams Auto Co., Petrel; Burkhard-Crippen Motor Car Co., Lexington; A. N. Jung, Sterling; National Auto Co., National; Hawley-King Co., Grabowsky truck; Lane Steam Car Co., Lane steamer; Newell-Mathews Co., Whiting and Westcott; Tri-State Auto Co., Hupmobile; W. K. Cowan, Rambler; Durocar Mfg. Co., Duro; Pioneer Commercial Auto Co., Reliance; Brush Automobile Co., Brush; Import Motor Car Co., Halladay; American Auto Co., Rider-Lewis; Fred A. Cornell Auto Co., Fal-car; Pico Carriage and Automobile Co., Paterson; Stanley Steamer Co., Stanley steamer; M. S. Bulkley Motor Car Co., Autocar; Mountain Brothers, Royal and Midway. In addition there are displays made of the Fiat, Great Western, Empire and Rauch & Lang electric.

CLOSING NOTES OF HARTFORD SHOW

The best show ever, is the report of the Hartford Automobile Dealers' Association at the conclusion of the one week's exhibition at Foot Guard armory. The show opened Monday of this week and closed this evening and practically all of the exhibitors of cars express themselves as well satisfied with the results attained. Certainly there is much interest in cars in this city as was proven conclusively by the heavy attendance throughout the week. More people visited the show this year than last season and there seemed to be more genuine interest by people who came to see the cars and not merely to look at them as something attractive. Naturally the lower-priced cars were centers of interest. The Maxwell, Flanders, E. M. F., Reo, Ford and Empire; 20 of the lower-priced cars were highly regarded. The Hupmobile surprised many an owner of a larger car when it came down to a real demonstration. The Velie and the Everitt "30," both of which are new to this section of the State, were well thought of. Practically every dealer in the show reports sales and enough demonstrations have been booked to keep them busy for some time to come. At the Park Casino the Jackson was very popular and many cars were signed up by the State agents. This car was in both shows; so was the Winton. The Belmont, another new Connecticut product which hails from New Haven, was a feature of the Casino show. Here, as at the Foot Guard armory, good business is reported. The Packard Motor Car Company of New York has several natty models on exhibition in the salesrooms on Allyn street.

DATE OF CONNECTICUT RUN NOT SETTLED

HARTFORD, CONN., Feb. 19—The final dates of the forthcoming All-Connecticut Endurance Run which is to be held under the auspices of the Automobile Club of Hartford have not been decided upon. May 1 is the date named by the American Automobile Association, but this date is too early for the Automobile Club of Hartford, and while no definite promise has as yet been received by the contest committee it is the general opinion that the dates desired by the club, that is, May 19, 20 and 21, will be conceded by the national body. The route as now laid out, which covers three days' travel, touches the border of New York State within a half mile, to within three miles of the Massachusetts border and within four of the Rhode Island border and in some places the route lies along Long Island Sound. While the run is confined to the State of Connecticut it affords about as hard a test as could be devised, as the hilliest parts of the State will be traversed on each of the three days of the run. The referee of the event will be Lewis A. Speare, president of the A. A. A., and S. L. Butler, chairman of the contest board of the A. A. A., will be assistant referee. The judges will be A. G. Batchelder, chairman of the executive committee of the A. A. A., and Alfred Reeves, general manager of the A. L. A. M.

BUDLONG DECLINES HEAD OF N. Y. DEALERS

Now that the licensed dealers in New York are in organized relation, all that remains is to complete the details of the plan, and find some one of the members who will be willing to accept the presidency and take the brunt of the fight. That there will be a certain amount of disagreeableness is to be understood, since otherwise there would be no occasion for segregating out the licensed dealers and lining them up. M. J. Budlong, who is the president of the Packard Automobile Company of New York, and who participated in the preliminaries of this new organization, did not indicate, until he was offered the presidency, that he would not be in a position to accept same. As a result, taking the last report, the committee is trying to find someone who will.

It is possible that General John T. Cutting may be induced to accept the office. It is also thought that R. D. Garden may be persuaded to assume the difficult task. At all events, it is thought that the presidency will be taken care of at a meeting which is scheduled to take place at an early date.

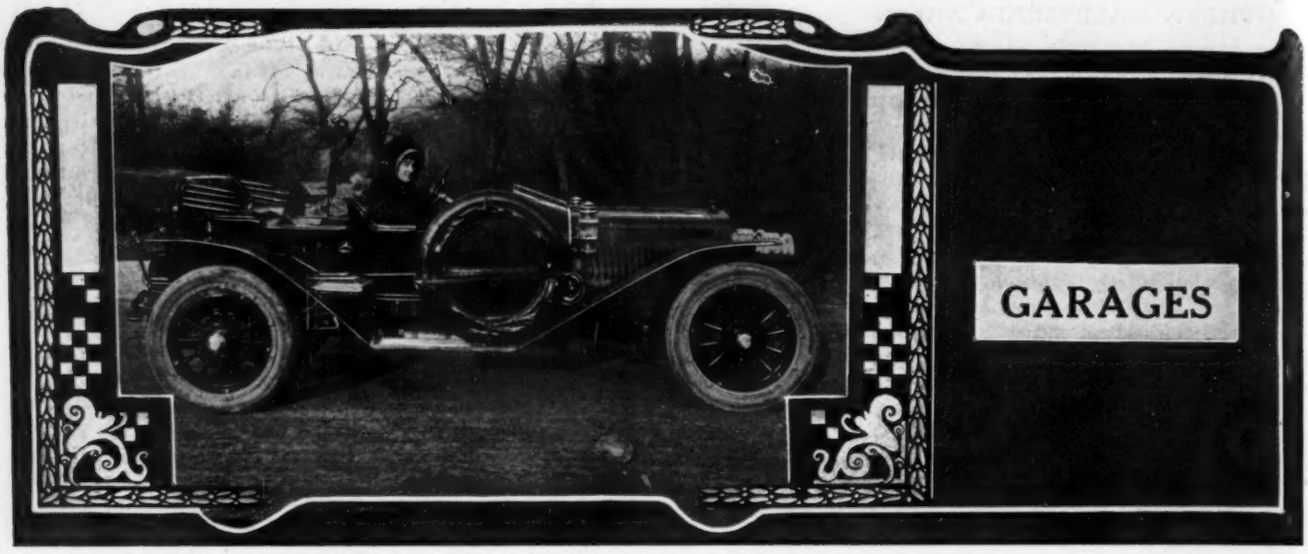
The directors of the Licensed Automobile Dealers' Association are: Carl H. Page, Chalmers; George W. Bennett, White; General John T. Cutting, Olds; Harry Fosdick, Lancia; C. P. Skinner, Mitchell; R. D. Garden, Pierce; M. J. Budlong, Packard; Sidney B. Bowman, Marmon; James Joyce, Alco, and John F. Plummer, Locomobile.

CHANGES FOLLOWING U. S. MOTOR DEAL

HARTFORD, CONN., Feb. 19—Fred A. Law, superintendent of the Columbia Motor Car Company, severed his connection with that concern this noon and leaves for the West, where his friends say he is to become affiliated with the General Motors Company. Before his departure from the plant, Mr. Law was called into the general offices and presented with a set of solid silver table ware. The presentation speech was made by Henry A. Castle of the sales department, and Mr. Law expressed his appreciation in a few well-chosen words.

COLONEL CLIFTON TO CARIBBEAN SEA

Charles Clifton, president of the Association of Licensed Automobile Manufacturers, and treasurer and general manager of the Pierce-Arrow Motor Car Company, leaves to-day with Mrs. Clifton for a month's cruise on the steamship Moltke to the West Indies and the Spanish Main. Since the decision in the Selden Patent case, Col. Clifton has devoted a great deal of time to Association matters. He expects to secure a well-earned rest on his trip to the Caribbean Sea.



The Briarcliff type of body, originated by the Lozier Motor Company, and shown above on a Lozier car, is very popular among those who desire a rakish and speedy-looking design

Martin Kelley and his son, George Kelley, have secured an interest in the Winnipeg Garage Company, Ltd., of Winnipeg, Canada. They have purchased all interest held by R. M. McLeod and C. McLaughlin. Mr. McLaughlin will remain as manager of the company for the present. This garage handles the Cadillac and Franklin, as well as the Columbus and Babcock electrics.

Green Bay, Wis., will have a new garage, Frank R. Buchholz having awarded contracts for the construction of a fireproof brick structure for D. G. Meyer, a well-known agent now located at South Washington and Doty Streets, Green Bay. The building will cost $10,000. It will be steam heated and have all modern conveniences. It is to be ready June 1.

H. E. Coffin, vice-president of the Hudson Motor Car Company, and president of the Society of Automobile Engineers

The Cream City Brewing Company, Thirteenth and Vliet Streets, Milwaukee, Wis., is building a large private garage for its delivery trucks. The company is using motor trucks almost exclusively. The building will be 100 by 160 feet in dimensions, of reinforced concrete construction, with complete equipment and repair shops.

James Beaver and Philip Fleming, of Lincoln, Ill., have closed a contract with Frank Klatt for the erection of a concrete or brick garage with concrete floor, 60 by 70 feet, on Broadway, which it is hoped will be ready for occupancy by April 1. They will handle the Hudson, Haynes and Chalmers cars.

The Auto Shop Company, Cleveland, agents for the Thomas car, will move to a large garage building being erected for them on Euclid avenue. After locating in new quarters three other cars will be added to the line.

The Gordon Motor Company, Inc., Richmond, Va., has, on account of increasing business, purchased a large lot on which it will erect a modern garage and salesroom at an estimated cost of $50,000.

The Prothers-McGinnis Auto Company, of Baraboo, Wis., has arranged for the erection of a large building during the coming Spring, which will contain its garage as well as a large equipped machine shop.

The Ames Auto Garage Company, of Orrville, Ohio, has been purchased by the Champion Thresher Company. The garage will be enlarged, and R. C. Taylor has been appointed general manager.

B. H. Smith, of Caro, Mich., is about to erect a one-story building to be used as a garage and repair shop, in which will be handled supplies, sundries and automobile accessories.

In Cleveland, Ohio, Harry S. Moore, agent for the Stoddard-Dayton, will open a garage and salesroom on Euclid avenue, continuing his place of business on Crawford road.

Peter Esswein, of Columbus, O., has taken out a permit for the erection of a brick garage building on Wall street between Rich and Walnut streets.

The Foss-Hughes Motor Car Company, of Philadelphia, agent for the Pierce-Arrow, is opening a new garage on North Broad street.

The Thomas Automobile Company, of Pittsburg, will build a new garage at once at 5509 Baum street, East End.

Fig. 1—Kenny Motor Car Company, Brooklyn, showing a night scene and decorated electric lighting. This is Brooklyn headquarters for Rambler automobiles

The new Wisconsin branch of the Buick Motor Company will soon have permanent quarters in Milwaukee. Contracts are about to be awarded for the construction of a four-story fireproof garage and salesroom building on Wisconsin Street, near the Government building and postoffice. The plans have been prepared by James Peden, supervising architect for the General Motors Company, and Brust & Philipp, architects, Milwaukee, have been selected to superintend the work. It is planned to have the building ready for occupancy on May 1. The offices of the branch, in charge of George P. Hewitt, Wisconsin manager, are now located at 505 Matthews Building, and the temporary garage on Thirteenth street. In addition to the Buick the branch distributes the Welch. The permanent garage is at the end of Wisconsin Street, the main artery of Milwaukee.

The Ideal Auto Car Company has been organized by Ole G. Kinney, of Colfax, Wis., and headquarters have been established in Eau Claire, Wis., for the distribution of the Ford and Brush in northeastern Wisconsin. The temporary location is in the Bonnell Carriage Company's works, and in the spring a large garage will be erected on South Barstow street, Eau Claire.

Rainier motor cars will be represented in Maryland by G. H. Ghaab, 116 W. Mount Royal avenue, Baltimore, Md. R. M. Robinson, Albany, has closed the agency for the Rainier in that city and district. Mr. Robinson also represents the Reo and has taken on the Rainier to supply the demand for a high-class car in central New York.

The Beaver Valley Motor Company, of Rochester, Pa., has been organized, with Stanley Q. Brown, of Rochester, as manager. It will have headquarters in the Traction Building, recently vacated by the Auto Sales Company. Mr. Brown has secured the agency for the Reo and Oldsmobile cars.

The E. W. Clark Auto Company, of Fond du Lac, Wis., agent for the Jackson, has now taken on the Fuller. President E. W. Clark states that the year's allotment consists of 58 carloads, 60 cars having been already received. The company also handles the Buick in the Fond du Lac district.

The Sterling car, manufactured in Elkhart, Ind., will be represented in Cleveland by the Sterling Motor Sales Company, a new company, with a capital stock of $30,000, of which J. C. Koepke is manager.

The F. M. Hacker Auto Sales Company has opened a salesroom at 18 Spruce street, Lewiston, Me., and will handle the Mitchell and Reo in Androscoggin and Sagadahoc Counties.

Thomas Salverson, of Waupaca, Wis., has been appointed a district agent for the Mitchell, of Racine, Wis.

The Tri-State Garage Company has started business in Uniontown, Pa., at 74-76 East Fayette street, with Jno. C. Shaw as manager. The company will handle the White and Ford cars.

The Cole "30," according to arrangements just closed, will be handled in Chicago by the Standard Automobile Company. F. C. Bailey is the manager of the local concern.

Oliver B. Brown, formerly of Brookhaven, Miss., has opened a salesroom at 605 Baronne street, New Orleans. He has the local agency for the Stevens-Duryea.

Fig. 2—M. J. Budlong, general manager of the Packard Motor Car Company of New York. Formerly general manager A. L. A. M.

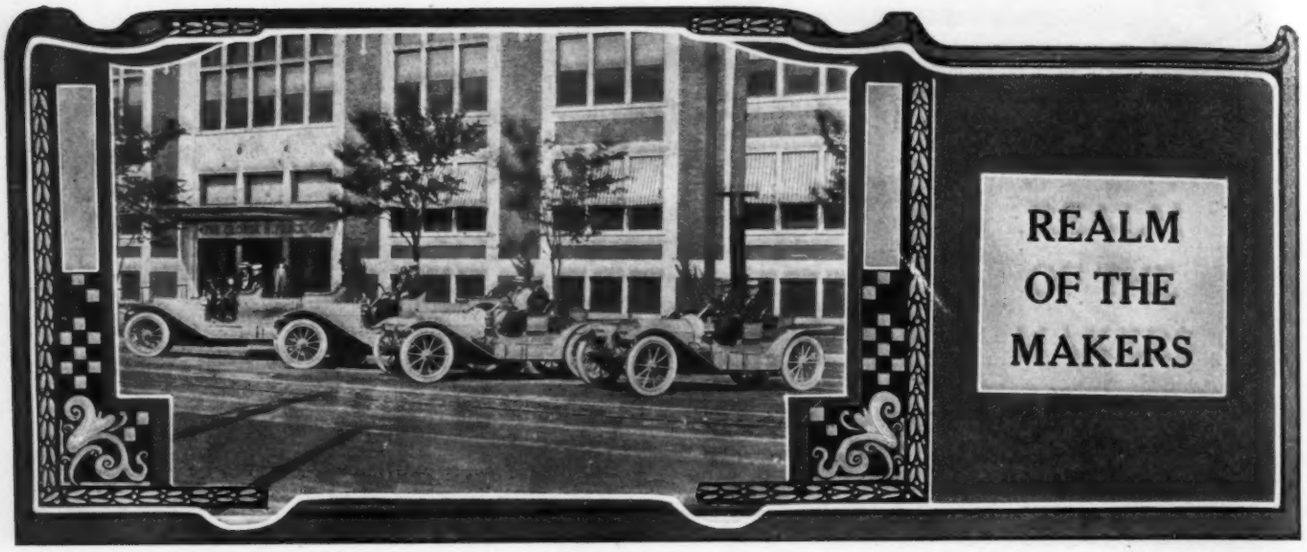


Fig. 1—A view of the Administration Building of the George M. Pierce Company, on Elmwood avenue, Buffalo, with a string of Pierce-Arrow automobiles in the foreground

The affairs of the Petrel Motor Car Company, 480 Virginia street, Milwaukee, Wis., were placed in the hands of a receiver on February 11 on petition of creditors. Referee Nye appointed the Milwaukee Trust Company receiver, under bonds of $1,000. The proceedings were begun by the Hess-Bright Manufacturing Company, Philadelphia, which has a claim of $220; the Herman Andrae Electrical Company, Milwaukee, with a claim of $239.62, and the Julius Andrae & Sons' Company, Milwaukee, $316.38. The involuntary bankruptcy petition cites that the company's estate is worth $30,000. The Petrel Motor Car Company was organized a year and a half ago, and established a factory in Kenosha, Wis. Later, through proper inducements, Milwaukee became the home of the company. The product is a popular-priced car, using the Waite friction transmission exclusively. It is believed that the company will be able to extricate itself from this legal difficulty in due time.

The Cartercar Company at the Detroit Automobile Show received an order from the Kellogg Toasted Corn Flakes Company, of Battle Creek, for twenty-four Cartercars, model "H," touring type. Instead of being equipped with the regular body these will be fitted with a specially constructed body built in the exact shape and proportions of the package of the goods manufactured by the purchaser. It is said that about $30,000 is involved in the deal.

The Columbus Buggy Company, of Columbus, O., announces that it will manufacture during 1910 100 electric and 1,500 gasoline cars. In addition to the models that have been placed on the market, the company has completed two new models, to be known as 74A and 1010. The model 74A is a gasoline runabout, with a torpedo body, built on entirely new lines. The style 1010 is a two-passenger electric, modeled after a runabout.

The Reliance Truck and Garage Company, incorporated several months ago, has announced the organization as follows: Theodore Leonard, president; Andrew Timberman, vice-president; George C. Bohn, secretary, and Frank Tray, treasurer. The company will open a garage and sales agency for the Reliance trucks.

Reports from Lima, Ohio, state that the Gramm-Logan Motor Car Company, of Bowling Green, Ohio, will invest half a million dollars in a plant in that city with a capacity of 1,500 cars annually. The plant at Bowling Green will not be abandoned, but will be devoted to the building of taxicabs.

The first shipment of Mitchells to the Orient was made last week, when a carload of 1910 models left Racine, Wis., for Seattle, Wash., where they will be loaded on the Puget Sound's Japan mail steamers and unloaded en route at Manila, P. I.

The manufacturers of the Babcock Electric Carriage claim a car which has made record time on the level and on hills, also that it has made more miles on one charge under the same conditions than has any other electric vehicle. This concern presents eight models.

It is stated that the Hudson Motor Company will build a $400,000 plant in Fairview, Mich. A site of 106 acres has been bought, and it is believed that the railroad will build a freight and passenger station in the vicinity.

The first shipment of E-M-F cars has already been disposed of.

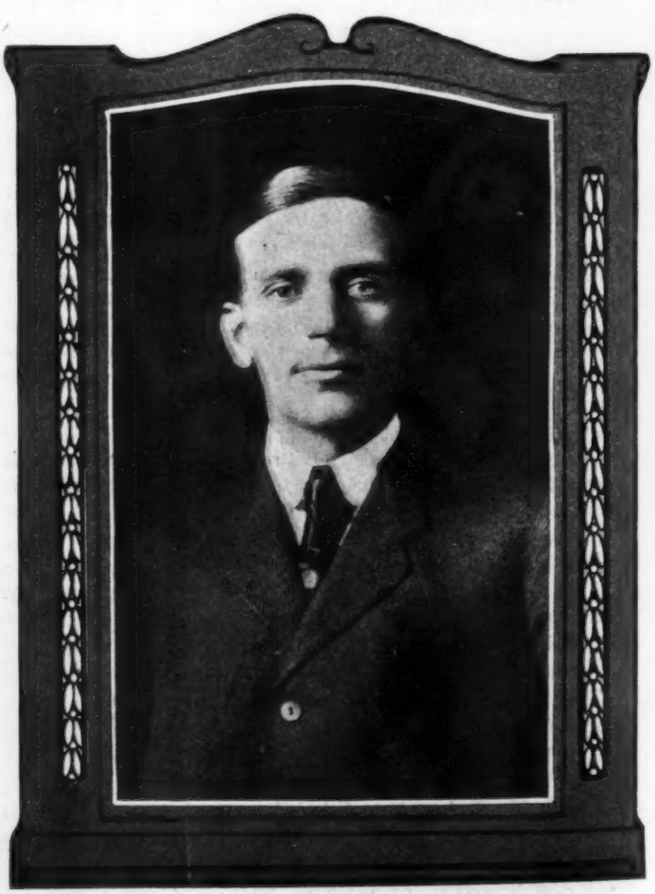


Fig. 2—S. D. Waldon, general manager of the Packard Motor Car Company of Detroit

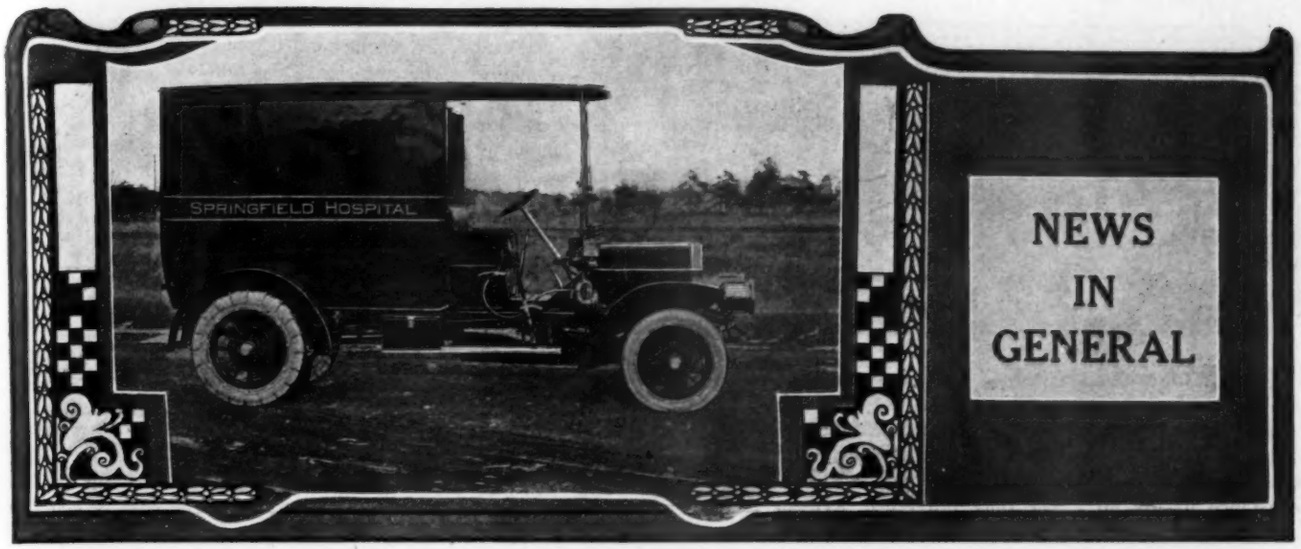


Fig. 1—Special design of hospital ambulance made by the Knox Automobile Company and used to very great advantage at the Springfield Hospital

It is authoritatively announced that the Eagle Manufacturing Company, of Appleton, Wis., has decided to reorganize at once, increase its capital stock, and engage in the manufacture of motor cars. The largest interest in the company is owned by the Saiberlich brothers, of Appleton. It is likely that the capital, which now is $6,000, will be increased to $200,000 and possibly $250,000. Appleton capital will be heavily interested. The new name will probably be the Eagle Automobile Manufacturing Company, and the product will be known as the "Eagle." It is planned to build two types of cars, a four-cylinder of 30 horsepower selling at $2,000 and a 4-40 selling at $3,000. W. D. Legge, an engineer associated with the Tuttle Press Company, of Appleton, will have charge of the new industry. Mr. Legge is now preparing plans and specifications and designs for the car, and it is planned to have the first car completed by May 15. However, the plant will probably not be in shape to begin actual production before June 1. Every part of the car will be built at Appleton.

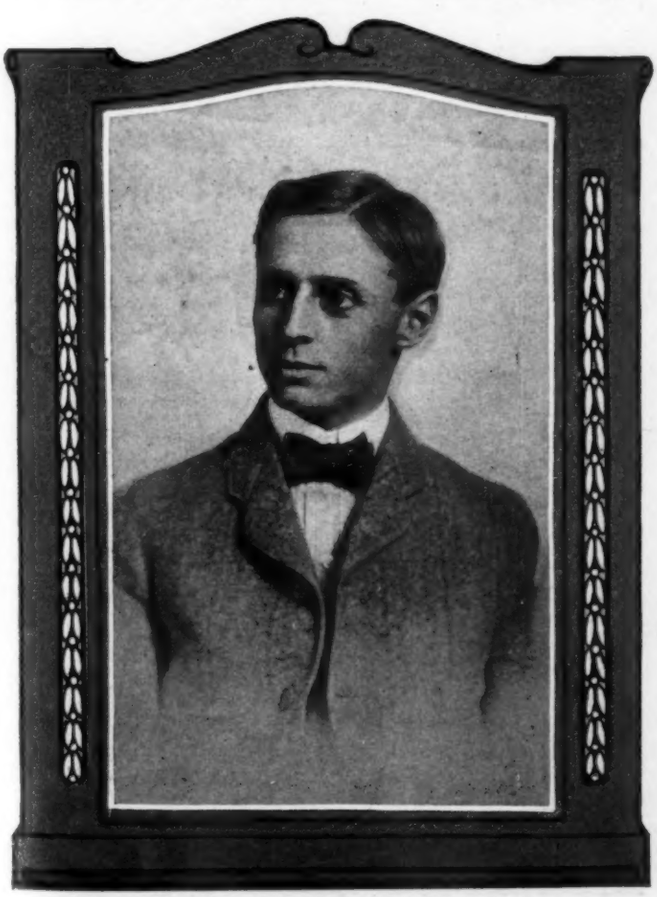


Fig. 2—L. H. Kittridge, President Peerless Motor Car Company, Cleveland, O.

A Sacramento (Cal.) man who runs a stage line between that city and Folsom solved the problem of carrying an increased number of passengers, without overloading his car or tires, in an original way. As the illustration shows, he took one car and attached the back part of another to the rear axle. Thus he was able to carry practically twice as many passengers as before at the same expense. The car is equipped with Morgan & Wright tires, and he reports that the car has been running between the two cities 4,500 miles a month for the past three months, 13,500 miles in all, with absolutely no trouble from either car or tires.

The automobile factory of Besserdich & Zachow, at Clintonville, Wis., producing a new type of four-wheel drive car, will probably move to Appleton, Wis. The Merchants' Association of Appleton has offered strong inducements, especially in a financial way, which are expected to lead to the reorganization of the concern to include Appleton capital and to engage in the production of the car on a large scale. The probable capital will be $50,000. The car is the invention of William Besserdich, formerly of Appleton.

G. A. Maisland, representing the Ingram-Richardson Manufacturing Co., of Beaver Falls, Mass., says the Syracuse Automobile Club inaugurated in this State the movement to place danger signs and railroad crossing warnings. He came here to renew his contract with the Syracuse Club for 1910 signs, and was heard to remark at the club's offices that his contract with the Syracuse Club for last season was the means of inducing many other clubs to place such danger signs along the roads.

The Abresch-Cramer Auto Truck Company has been incorporated in Milwaukee, Wis., with a capital stock of $20,000. The incorporators are Charles Abresch, Robert Crawley and L. Schneller. Charles Abresch is at the head of the Charles Abresch Company, 398 Fourth street, Milwaukee, which has been manufacturing wagons and carriages and now devotes most of its time to building bodies and a line of commercial vehicles.

At Los Angeles, Cal., the Moline Car recently made a "mile-a-minute" record on the motorcycle saucer track.

PROMINENT ACCESSORIES

Quite a little attention is being paid to aeroplane work by the Livingston Radiator & Mfg. Co., of West Fifty-second street, New York City. The Livingston radiator is particularly adapted to aeroplane work because of its extreme lightness of construction, great strength, high efficiency and small resistance to the air. The only difference between the aeroplane radiator and the automobile radiator is the style and size, the principle being identical in every case. By using a design that is a great improvement on the square-tube radiator, it has been found possible to produce a cooling device showing 100 per cent. increase of direct radiating surface in contact with the circulating water. In fact, the circulation is equal both perpendicularly and laterally, through the cooling tubes, and at no time is there dead water in any portion of the radiator. Equal circulation through all the tubes is secured by the square corrugations. The combined area of the water passages is over 15 square inches, equal to the discharge of a pipe 4 1-2 inches in diameter.

These features, together with the fact that there are 64 square inches of radiating surface in direct contact with the circulating water for every square inch of frontal area, makes the radiator an extremely efficient one.

Patented lapped seams on all edges with the patented tubes increase the strength enormously and permit a pressure of over 30 pounds to the square inch, without any danger of leaks.

The resistance to the air is reduced by the patented swaged edges, which form the water passages without the use of space wires, thus saving weight and reducing the amount of solder used. The edges form sharp funnel-shaped entrances to the air passages, so that the radiator completed offers only one-sixth of the total area as resistance to the air, whereas in most cases one-half or more of the total area is offered as resistance to the air.

Throughout the entire construction the idea of great stability is never lost sight of. The radiating section and the frame are built complete in themselves and then assembled. All joints in the frame are made with long overlaps, reinforced with special pieces of the correct shape on the inside. Even the brackets are riveted fast and covered on the inside with an extra sheet of metal so that no leak could occur even though a rivet might tear loose.

The sides of the radiators are blocked off thus forcing the water to pass through the radiating section instead of down the sides.

Although the company did not begin active operations until October of this year it has already placed contracts with several concerns. Of course the aeroplane work will not be so heavy at first, but even this phase of the project is attracting considerable attention.

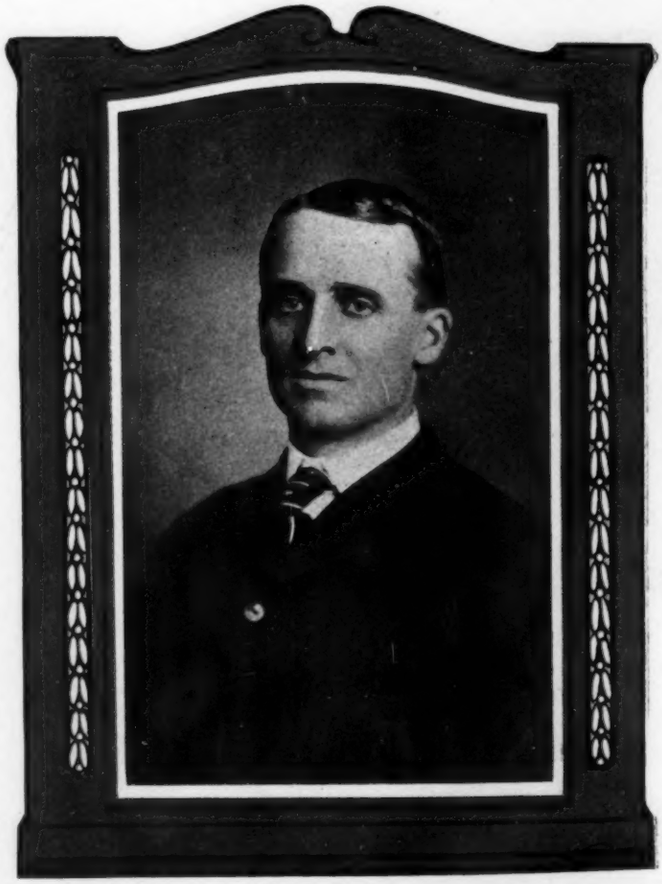
Among the novelties recently imported from Europe by Chas. E. Miller, the jobber, of 97 Reade street, New York City, is the "Radium" illuminated dial watch, on which the time of night can be distinctly seen in pitch darkness. This watch, it is believed, will be found of great interest to the public in general and to automobilists in particular. The hour divisions on the dial are indicated by dots of a luminous substance, and the hour and minute hands have a narrow line of the same substance imbedded in them. It might be thought that some difficulty would be experienced in reading the time without the usual numbers at the hour divisions, but it has been demonstrated by psychologists that these are not really necessary, for the reason that no one really looks at them. This is proved by the numerous advertising clocks which have letters, forming a name, instead of the numbers. In practice it has been found that it is as easy to read the time from this illuminated dial watch in the dark as from an ordinary watch in the light.

The watch has also an alarm attachment, that they may be set at any desired time as usual. It has an "Anchor" movement. A special brass case is furnished for the attachment of the watch to the dashboard of an automobile. The case is fastened with a plug lock, which permits of the watch being removed only on the use of a special key.

"A.B.C." jack, of the ratchet type.

The A. B. C. Jack Company, 14 Columbus avenue, Boston, has put on the market the "A. B. C" jack, which sells at a moderate price, and embodies many distinct improvements over the ordinary type. The jack has a ratchet movement, with a separate lever handle. By a special device the handle is locked, so that it is impossible for it to come out while the jack is in operation. The parts are few and interchangeable. The movement is single action, controlled by a small lever projecting from the frame.

In appearance the jack is simple and neat, all the mechanism being enclosed; the only projecting part is the reversing handle. The base is ample in size, and on the whole easy and powerful action seems to have been combined with light weight.



Windsor T. White, president of the White Company, one of the family who revolutionized the steam automobile industry